



North Dakota Project Management Guidebook Risk Management Supplement

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Preface

Introduction

This guidebook was developed through the North Dakota Enterprise Project Management (EPM) process, and was created to assist project managers in carrying out their duties. The guidebook provides a common methodology for managing project risk within state government. Although it may look intimidating, it is designed to supply enough detail to guide new project managers through the project management process, while still being valuable for those more experienced in the field.

Purpose

A common methodology encourages individual project managers across the state to approach each project endeavor with the same discipline and tools. Since the methodology is common to all business areas and across all agencies, state project managers moving to new opportunities within and among state agencies will have a reduced learning curve for project management.

The Risk Management Supplement also provides guidance for agency staff to use when contracting with private vendors. The state can now provide the methodology for its contractors, rather than requiring North Dakota State staff to adjust to the different performance standards of each firm with whom they contract. Again, utilizing one common framework within which all North Dakota State projects can be carried out improves the state's ability to complete the projects successfully.

Acknowledgements

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Structure of the Guidebook

The Project Risk Management Lifecycle

The first and primary section, the Project Risk Management Lifecycle, guides a project manager through the complete project risk management cycle of a project, detailing the specific processes to be performed within each phase and defining the tasks that comprise each process. The processes cover the most recognized project management practices in the profession today, adhering to the Project

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Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) and is a supporting process document for the North Dakota Project Management Guidebook.

Specific templates are provided to supplement the tasks and processes, including meeting agendas, deliverable templates, checklists, and forms. Tips and techniques for successfully performing the tasks/processes are offered, as are answers to "frequently asked questions". At the end of each phase, common pitfalls faced by project managers are described, along with solutions that could be used to successfully deal with those challenges. The hope is that a project manager will find useful direction for what to do, when to do it, and how to do it, no matter what stage of the lifecycle his/her project may be in.

Templates

The templates included in the guidebook contain instructions and comments facilitating their use. The templates can be downloaded from the EPM website at <http://www.state.nd.us/epm> for use and customization for your project.

Finally, use this guidebook as a tool to help you manage the project. Don't let the process or the project manage you!

Chapter 1: An Introduction to Project Risk Management

Purpose

The goal of project risk management is to avoid, minimize or adjust for negative impacts of adverse events and seek, maximize or enhance the positive impacts of opportunities. It is important to remember that risk is not only for negative events. Maximizing the opportunities for positive events could help the project save time and money. Risk Management needs to be an integral part of the overall project effort and is necessary to minimize the major sources of rework, schedule and cost overruns, and performance and quality degradation.

According to the Project Management Body of Knowledge (PMBOK®), project risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives. This could include time, cost, scope, quality, or customer satisfaction. Risks can have more than one cause and also more than one impact. So by recognizing potential problems the project manager and core team members can avoid many of these problems through proper actions.

You define how the team will manage risks in project planning, documented in the risk management plan, and then executed through the life of the project. Risk Management is the process of thinking systematically about all potential undesirable outcomes (or opportunities) before they happen and determining procedures that will avoid them, minimize their impact, or cope with their impact.

For example ...

Each organization has its own risk sensitivity. It is important for you to understand how risk adverse your organization is in order to properly plan your responses. Some organizations are more willing to accept risks if the rewards merit it. Others are not willing to accept even minimal risks. There are also organizations that don't typically identify or manage risk at all. All of these factors will impact how people respond to your risk planning and response efforts. Your risk response will need to reflect your organizations' risk sensitivity.

It is important to be open and honest about risk in your project's communications.

To be truly successful, you must be proactive and consistent in how you manage risk throughout your project.

Key Processes

There are many steps in the risk management process. However, that doesn't mean it has to take a lot of time. The key steps in risk management are:

Risk Management Planning

Risk management planning forms the foundation for all the rest of your efforts. You must develop the process on how you will handle risk in your project. Even if your organization has a pre-defined process for handling risk, you still need to look at how that fits in your project and if you will need to modify the project in order to follow the appropriate process.

Risk Identification

The next step is to determine which risks might affect the project and document their characteristics. It is important to identify risks and state them clearly so the team can come to a consensus and move on to analysis and planning. The goal of the risk team is to create a list of risks that could impact the project. There are a number of methods you can use to perform risk identification and we will cover these more in-depth later.

Qualitative Risk Analysis

It is likely that you identified a large number of risks to your project. You need to be able to narrow down how many you actually need to plan for. You do this by determining what the likelihood is for each risk to occur, and if it does occur, what impact would that risk create. After all, it is possible that a meteor could smash into the data center, but the likelihood of it occurring is so low and if it did occur your project's priority would drop so far down that it doesn't pay to spend a lot of time planning contingency plans for the event.

Quantitative Risk Analysis

Qualitative analysis is still quite subjective. It uses the best judgment of the participants. Quantitative analysis allows you to take those that have the highest likelihood and impact and start putting some number to them. Again, there are a number of methods you can use to assist with this and should help you again reduce the number of risks that you need to move on to the next process.

Risk Response Planning

Now you take the critical risks and start looking at methods to, first avoid the risk, second to mitigate the likelihood or impact of the risk, and third create contingency plans should the risk occur despite all our efforts.

Risk Monitoring and Control

Once your project is executing, it is important to keep risk out in the open. Constant communications about risk, reacting appropriately when something does occur, and looking for new risks gives you the best chance of successfully completing your project.

Stakeholder Roles and Responsibilities

It is critical for risk management to understand and identify all stakeholders and the role they will play in the project. You need to include stakeholders from outside the team in the risk management process because these stakeholders will see risks that the team does not. There are a number of things you need to be aware of when reviewing your stakeholders. For example, "Have the stakeholder's roles been clearly defined and do they understand them?" and "What are their known objectives and do they have any hidden objectives?" Hidden objectives are needs that are not stated, but provide motivating factors for either seeing the project succeed or fail.

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Below are some common stakeholders that you should be engaging in your project risk management process.

- Project Sponsor
- Project Manager
- Project Team
- Performing Organization Management (POM)
- Quality Assurance/Quality Control Team
- Customer Management
- Customer Subject Matter Experts
- Consumers
- Vendors
- Experts
- External Stakeholders

So let's get started managing the risk on our project.

Chapter 2: Risk Management Planning

Purpose

If you don't know where you are going, you will probably end up somewhere else. ~
Laurence J. Peter, author of *The Peter Principle*

Just as the first step of a project is planning, your first step in risk management is planning how to approach and execute risk management activities. You need to make sure the level, type and visibility of your risk management is appropriate for the size and type of project, and fits the organization's risk sensitivity.

Risk management planning should occur early in the planning process because it will influence not just the rest of the risk activities, but also many other aspects of general project planning.

There are three main steps in the risk management planning process

- 1 **Gather and Review Available Information**, where the project manager researches and understands the information already available;
- 2 **Hold Planning Meetings and Perform Analysis**, where project teams define the risk management plan; and
- 3 **Develop Risk Management Plan**, where you describe what processes you will use and how you will perform risk management on the project.

Process

The risk management section of the project plan is the deliverable completed in this step. This section includes a description and process on how risks will be managed in the project, the process on how new risks are identified and assigned during the project, and a template risk register with definitions of each of the elements of the register. The risk plan should also include the table used to determine the risk score. You can find a sample risk plan in [Appendix C](#).

The process for developing a risk plan is as follows:

2.1 Gather and Review Available Information

- Identify Organizational Environment
- Identify Organizational Processes
- Review Historical Records and Project Background
- Review Project Scope Statement
- Review Project Planning Outputs

2.2 Hold Planning Meetings and Perform Analysis

- Schedule & Plan Meetings
- Hold Meetings
- Analyze Information & Form Consensus for Risk Management Strategy

2.3 Develop Risk Management Plan

- Introduction
- Definitions
- Organization
- Structure & Procedures
 - Risk Assessment
 - Identification
 - Qualitative Analysis
 - Quantitative Analysis
 - Risk Response Planning
 - Risk Monitoring and Control
- Risk Register



Risk Register vs. Risk Log: So what's the difference between these two items? PMI recognizes the risk register but common usage often substitutes the two terms. The risk register is your complete list of risks for your project. It generally includes the risk score, assignments, and planned responses among other things. Sometimes, for communication purposes, the project manager needs to boil this down to just the risks that are active and their current statuses. This is what the state of North Dakota's Enterprise Project Management Office recognizes as a risk log.

2.1 Gather and Review Available Information

Purpose

There may be material available to the project manager relating to how the agency prefers to handle risks in projects. In addition, agency PMOs and the Enterprise Project Management Office also have resources available to the project manager (including this document) to assist them with the development of their own project risk management plan. Any project management tool that is available will also influence how you handle risk management. Proper preparation will reduce the problems experienced once you start your risk meetings and plays a key role in minimizing the amount of time it takes to complete the process. The project manager needs to make sure that the risk management plan meets all of the organizational requirements.



Do your research! One of the biggest issues with risk management is that people feel they are wasting a lot of time talking about what might not happen. One way to avoid this with your team is to have the foundation and requirements already laid out in your first meeting. Then everyone's focus can be entirely on the project and project tasks.

Tasks

2.1.1 Identify Organizational Environment

Every organization is different in what level of risk they are willing to accept on projects. Usually this risk tolerance is tied to the “triple constraint”: Cost, time, scope, quality. Other areas, such as customer service, should be identified during this exploratory step. You should also be identifying where the stakeholders rank the project in importance. If a key stakeholder rates the project low in priority, there may be some additional risks you need to address.

If you have been working for your organization for some time, you probably already have a good feel for how risk adverse your organization is. If you are new to the organization or to project management, there are a number of people who can help you with this step.

Other project managers in your agency or the agency project management office (PMO) can also help. If you don’t have a PMO within your agency, the Enterprise Project Management Office (EPMO) can give you some general advice.

Your project sponsor is another good place to start. He/She should be able to help you identify your agency’s risk adversity level. Another good resource is your supervisor.

Even experienced project managers can benefit by touching base with these contacts to find out if changes are occurring of which they may be unaware.

2.1.2 Identify Organizational Processes

The project manager often does this task concurrently with the above step. This document provides a broad structure on how you should do project risk management in North Dakota state government. However, each agency is likely to have some additional specific practices in order to accommodate their business environment. Also, as noted above, the software tools available often dictate some of your processes. Your PMO, supervisor and the EPMO can help you with where to find this information.

Keep in mind that while software can assist you, risk management is a people oriented process. This document will provide samples and templates for many processes. However, you should be cautious in how you employ them. For example, templates tend to limit the way people think, forcing them to stay within the boundaries set by the form.



Try an experiment. Ask 3 teams to come up with a list. Provide one group with a blank piece of paper, the 2nd group with a table that has some column headers, and give the 3rd group a complete form with form header data and column & row headers. Compare the responses. Did the groups with forms stop after they ran out of lines? Who came up with the most creative item? Who had the most ideas?

2.1.3 Review Historical Records and Project Background

If you have read the PMBOK®, you know the importance the Project Management Institute (PMI) puts on historical records. Unfortunately many places do not have good historical records to look back upon. That means many projects must start from scratch. If you do have historical records, some of the things you should be looking for are:

- Lists of risks and risk categories
- Lessons learned

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- Benchmarks or metrics used previously
- Methods used for risk management

In addition, be sure to review your project's business case, any studies or reports used to create the business case and budget, standards that will apply, any contracts that are already in place and literature related to similar projects done by other states.

You will also want to determine some of the following items:

- Who are the experts you will be able to use?
- What is the priority of this project in relation to others?
- What cultural issues will be faced?
- What level of organizational change management will be required and what support is available for it?
- Will you be able to access the organization's HR structure for help?

2.1.4 Review Project Scope Statement

Once you understand the organizational requirements and have reviewed the background material, take a look at the project scope statement. This is where you start to see how your project will fit into the general process and if there are any conflicts that need to be resolved prior to moving forward; for example, if your organization's processes require all rollouts of new software to be done in stages but your scope statement says that the rollout must occur to all employees at the same time.

2.1.5 Review Project Planning Outputs

Finally, take a look at what you have already done in project planning. Often, even in a template document, you will see connections between the different areas.

- Will you be able to integrate with your change control plan, your issue management plan and your communications plan?
- Are there any areas in the work breakdown structure that don't seem well defined or haven't been broken down to less than 80 hours?
- Examine the network diagram for critical and near-critical path tasks, parallel paths, and points of convergence.
- Look for overly optimistic or pessimistic estimates. Did the team use three-point estimates? Plan to examine those tasks more closely whose optimistic and pessimistic estimates have a wide range as that would be an indication that there are risks to be identified.



Studies show that projects using only a single estimate for activity effort only have a 5% to 15% chance to succeed.

- Review your other project management plans. While many of them may not be complete, look for things like problem or high demand stakeholders, reporting relationships, any vendor relationships and past performance, your involvement in the contract development, and any assumptions and constraints.

2.2. Hold Planning Meetings and Perform Analysis

Purpose

Now that you have prepared yourself with what the organization expects of your project for risk management, you are ready to get meet with your team and other experts to ensure you have identified the processes involved and to start focusing on how you will apply risk management to your specific project.

Tasks

2.2.1. Schedule & Plan Meetings

Project managers understand the importance planning has on the success of an endeavor. However, it is surprising how often we forget that when it comes to meetings. Preparation includes making sure you have the tools you need and that the room is set up in the manner you want.

There is an old joke about having meetings to have a meeting. But the truth is sometimes you need to have some preliminary discussions in order to make sure you can accomplish what you want in the primary meeting. For example, you will probably want to perform your stakeholder meetings prior to meeting with the risk team to ensure your processes address their needs.

2.2.2. Hold Meetings

Now it is time to hold the meetings. Do not try to do these by yourself. It is virtually impossible to ask questions, listen to the answers and respond appropriately, as well as document the responses. So bring some help. Ideally, bring two other people to document for you. According to studies, anywhere from 50%-93% of communications are **non-verbal**. If you ask the questions, then have one person focus on just writing down the answers and have the other person focus on the non-verbal communications. Just be sure you identify who is doing what prior to the interview.

A team like this should give you the best chance to walk away with all of the information you need.

Initial Stakeholder Meetings: Start by identifying stakeholders' tolerance areas and thresholds. Tolerance areas are most often things like Cost, Scope, Schedule and Quality. Other areas could include customer service, response time and downtime. A threshold relates to the point at which the stakeholder says "stop, this is too much." Thresholds can relate to the whole project (e.g. a buildup of multiple issues) or a particular threshold area. These meetings should be a mix of people in all categories identified in Chapter 1. One other key thing to look for in these interviews is the hidden objectives, those things not actually stated, but influence how the person will relate to the project. Keep in mind, these meetings are risk "planning" not "identification".

You should be able to develop a table like the one below after your interviews.

Table 1: Stakeholder Tolerance/Threshold Chart

Stakeholder	Tolerance Area	Threshold
John Smith – Agency Financial Director	Budget	Funding grant rules state that at least 50% must be spent by Oct 1, 2007 and grant must be 100% spent by Oct 1, 2008.

	Budget	Project must be completed within the budget including the Management Reserve.
Mark Thomas, Customer Management	Quality	The system must be able to process at least 10,000 transactions per day.
Jane Dillon - Customer SME	Customer Service	Can only perform project activities from 1-3 each day during December.

Sponsor Meeting: You can get a lot of information from the sponsor. Besides the tolerance area/thresholds discussed above, you should also be able to get a lot of the organizational items we discussed earlier in this chapter.

2.2.3. Analyze Information & Form Consensus for Risk Management Strategy

Now it's time to bring the project team together to develop your risk management plan. Present the information that you have gathered. Discuss the impact to your project. Identify any additional conflicts between the processes and project. Remember that you are not trying to gather specific risks. Ensure the meeting doesn't become a risk identification meeting. You want to approach risk identification in a different manner in order to make sure you miss as little as possible.

You will want to identify the participants in the risk process, how you will group them, and what techniques you will use with each group to gather risks. Studies show that 50% more risks can be identified by involving SME & end user stakeholders. This is even higher when the PM doesn't have specific business experience.

As the final outcome of your meeting, you should have a consensus on how you will manage risk for the project. There should be an agreement on the processes you will use in the project, the information captured by the risk register, etc. You should leave with everything you need to write the risk management plan. We will cover that in the next section.



Many times it works well to use a video projector to show the organization's template risk management plan during the meeting and work on it where everyone can see you make the changes. Not only does it allow you to walk out of the meeting with consensus, but you are done with most of your follow-up work. However, be sure to tell everyone that this is not the place to do wordsmithing; otherwise you may not be able to get through the entire document. It also helps if you have someone else do the typing so you can focus on leading the meeting.

2.3. Develop Risk Management Plan

Purpose

Once you have gathered all of the materials and worked with the team to agree on how risk will be handled in your project, it is time to write it all down. The resulting Risk Management Plan should be scaled to the size and type of your project. Smaller projects may just use the template information with

a few minor modifications; more complex projects may need to make additional modifications. Be sure to clear any major changes to the organizational process with the appropriate authority.

Tasks

2.3.1. Write the Risk Management Plan

The plan should contain the following sections:

1. **Introduction:** This defines the purpose and objectives for risk management. You seldom change it from the template form. Its primary role is to provide understanding for those involved in the project that may not have had prior experience with a structured risk management approach.
2. **Definitions:** This section should define the risk terms and how the project will use the terms. Again, you will probably just use the template, but you should look at the ranges on probability of occurrence and the risk impact to make sure they fit your project. (See section 4.2.1).
3. **Organization:** This section defines the roles and responsibilities for risk management. It should include how the EPMO, PMO, project manager, and key stakeholders are responsible for risk management. This could vary greatly from agency to agency, but once defined within an agency it will probably not change much from project to project. If this is already defined in your project plan you do not need to re-define it here.
4. **Structure & Procedures:** This section defines exactly what you will do to manage risks in your project. It is usually broken out into the component Risk Management parts. Don't be too concerned if you are not completely clear on each of the items below. Most will be covered in the following chapters, so read on and then come back and re-read this section.
 - a. **Risk Assessment:** An overall assessment of risk for the project and how much effort the project will use for risk management activities. It contains some basic statistics about the project that tend to impact the level of risk for the project allowing for a somewhat subjective assessment of the overall project. This then allows the project manager and project sponsor to determine how much risk management is appropriate for the project.
 - b. **Identification:** The process used to identify risks in the project. It should include specific activities, owners of the activities and a time estimate to perform the activities.
 - c. **Qualitative Analysis:** The process used to develop the risk score and filter the risk list so the team can focus only on those risks that need to be managed and come up with an overall project risk score. It should include specific activities, owners of the activities and a time estimate to perform the activities.
 - d. **Quantitative Analysis:** The process used to make a more objective assessment of the risks and to provide another filter to what risks will move forward into response planning. It should include specific activities, owners of the activities and a time estimate to perform the activities.
 - e. **Risk Response Planning:** The process used to determine how the project will respond should a risk occur. It should include specific activities, owners of the activities and a time estimate to perform the activities.

- f. Risk Monitoring and Control: The process used to monitor the project for risk events, both previously identified and new unidentified risks.
- 5. **Risk Register:** At this point you are just defining the format/layout of the register. Sample Risk Registers can be found in [Appendix B](#).

For more assistance, check out the Sample Risk Management plan in [Appendix C](#).

2.3.2. Get Approval of the Risk Management Plan

After you have completed the draft of the risk management plan, you should meet with your project team and review it. The team may identify some pitfalls or missing process steps that you will need to address. After you get their agreement on the plan, you should take it to the project sponsor for approval. They should look at it from the high-level perspective to make sure it fits within their and the organization's expectations.

2.4. Conclusion

Preparation is very important in both project management and risk management. Developing the risk management plan allows you to make sure you are using just the right amount of risk management for the scale of the project. It also helps prepare the way, so that you can make the most efficient use of the time you do spend performing risk management tasks.

Next we will move into Risk Identification. It is one of the most important steps in the risk management process.

Chapter 3: Risk Identification

Purpose

As PMI defines the term, risk identification is “the process of determining which risks might affect the project and documenting their characteristics.” This chapter will explore the processes and techniques for identifying project risks.

You must identify risks and state them clearly so the team can come to a consensus and move on to analysis and planning.

During risk identification, the goal of the team is to create a list of risks, both the ones you know the details and general risks that need more detail. The risk identification method you use can help identify and clarify the uncertainties and concerns of a project’s technical and managerial staff. They are close to the problems at their level and have the experience and knowledge to recognize potential problems in technical, procedural, and contractual areas.

There are three primary steps in risk identification:

1. **Prepare for the process**, where the project manager gathers & reviews available knowledge regarding general and project specific risk in relevant business, technical, organizational, and environmental areas, schedules the sessions, and prepares the facilitation materials.
2. **Gather project specific risks**, uses specific techniques to gather and review project risks. Make sure you gather enough information to be able to move on to the qualification process.
3. **Create a risk list**, where the project manager enters the risks into the risk register in preparation for Risk Qualification.

Process

The output from the risk identification activities is a list of risk statements articulating the risks the project team has identified within the project. The risk list is the main input for the next stage of the Risk management process—analysis. The risk identification step frequently generates other useful information, including the identification of root causes and downstream effects, affected parties, owner, and so forth. The project manager should note this information for use later in the risk management process.

The following are the steps involved in risk identification

3.1. Prepare for the process

- Review Key Documents
- Schedule Sessions
- Prepare Facilitation Materials

3.2. Gather project specific risks

- Define Risk
- Identify General Project Risks
- Identify Risks by Task
- Know when you are done

3.3. Identification Techniques

- Affinity Diagram
- Brainstorming
- Delphi
- Fishbone (Ishikawa) Diagram
- Interview
- Nominal Group
- Pre-Mortem
- SWOT

3.1. Prepare for the process

Purpose

There is a lot of data available that will help with identification. You want to gather this data and have it available during the risk identification process. It is important for you to be generally familiar with these inputs in order to help guide the team during your identification sessions. The more prepared you are for the identification process, the less time it will take to complete.

Tasks

3.1.1 Review Key Documents

Review Risk Management Plan

One of the first inputs to the process is the Risk Management Plan you just completed. It helps define the boundaries on how detailed you will get with identifying risks and will guide you in facilitating your risk identification meetings.

Review Organizational Processes

Every organization manages risks differently. The project manager must be aware of the organization's risk tolerance and processes used to manage risk. You should also be reviewing your historical records. Look for similar risks in other projects so you can review what the response was in that project and whether it worked or not. Look for the real dollar impact of risks that occurred.

This kind of information could be valuable and lead to additional risks identified for your project. Currently North Dakota state government does not have an enterprise database of easily searchable risks.



Did you know the state of North Dakota has a Risk Management division in the Office of Management and Budget (OMB) that can assist project managers with contractual insurance requirements and indemnity language? In fact, they, along with OMB's Procurement Office, the Attorney General's Office and (for information technology projects) the procurement section of the Information Technology Department, are available to assist you in determining and evaluating procurement related risk.

Review Project Management Plan

The project cost management and schedule management plans are important data to have available during analysis. The project manager needs to have this information when facilitating risk quantification discussions.

Review the WBS

At this stage, you should have completed your Work Breakdown Structure (WBS) and identified your critical path. Make sure you know what your tasks are, what the dependencies are, and how much slack is available for each task. All these items play a critical role in risk identification. Also, confirm that you have all your questions about the project answered (e.g., Does the project include training field staff?).

Review Project Budget

The cost estimate from the project plan should provide valuable information relating to budget risks. If the current cost estimate uses up most of the entire planned budget, then you are left with no contingency. Very few things go exactly as planned. You will want to prepare to work with the team to focus on some of the most expensive tasks to determine if there is anything you can do to make sure the task comes in at or under budget.

Review Staffing & Procurement Plans

The more people assigned to a project the more complex the project becomes. When those people are with another company or even a different division in your own agency the complexity becomes exponential. Review the procurement plan to identify key risk areas that you will want to cover with the project team.

The North Dakota Enterprise Project Management Office has a number of checklists and templates (including ones found in this guide) to help you with preparation for your risk process. Your own agency's Project Management Office may also have some things available to you. Be sure to take advantage of those items to prepare yourself for the risk identification meetings.

Finally, check your archives for other projects that may have been similar, dealt with the same vendor, or have some similar tasks. Review the risk plans and lessons learned from those projects to help give you some ideas on where to focus your attention.

3.1.2 Schedule Sessions

Now you can finally start scheduling sessions. Some questions to ask yourself first are:

- How many sessions will you need?

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- Who should be included in the sessions?
- How long should each session last?
- What methods will you use during the sessions? You should have determined this as part of the Risk Planning process.

3.1.3 Prepare Facilitation Materials

Successful meetings don't just happen. Here are some great tips for a successful risk identification meeting:

- Make sure your materials are ready for each meeting
- Rather than have everyone wait while you title each of your flip charts, pre-title as many as you can
- Arrive early to your meeting and get things set up
- Set-up the projector, easel, and sticky notes
- Have your risk categories selected and charted out. Risk categories are general classifications that you can group risks into. One example would be Budget. You can find more examples of risk categories in [Appendix D](#). You can always add or remove categories if necessary after the identification process, but you want to use everyone's time most efficiently as possible.

3.2. Gather project specific risks

Purpose

It is time to take a close look at your project and begin to identify risks. A strong identification process will improve and simplify the ability to perform the next step in the risk management process of analysis. You should have a large number of risks identified, however, only a small number of them will require any considerable effort. But if you don't do a thorough job of identification, you will probably miss something significant.

You need to make sure you don't just focus on the negative risks during identification. You should identify positive risk, or rather, "opportunities," as well.



The concept of positive risk can be hard to imagine, but it is important to address. This is kind of like the phrase "You make your own luck." You want to optimize your project so you are prepared to take advantage of every opportunity to get ahead.

Task

3.2.1 Define Risk

You need to break out the difference between risk and fact. Risks are unknowns and facts are knowns. One way to do this is to look at the formula *Cause-Risk-Effect*: Because (cause), an event may occur (risk) impacting the project as such (effect.)

- Cause = Fact
- Risk = Unknown

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- Effect = Potential Outcome

Let's try an exercise. In the first example below, the team being spread out is a fact not a risk. Look at the following and identify which are well defined risks:

- Because the team is spread out across the state, communications may take longer causing missed deadlines.
- Because people are overloaded with work, they may not be available to work on the project.
- The backup system may not work which could delay the project.

If you chose none of the above, you would be correct. The following is how the risks should be stated:

- Because the Project Manager is not used to working with virtual teams (*Cause*), he may not allocate enough time in the schedule for communications (*Risk*) and milestones might be missed. (*Effect*)
- Due to lack of participation by SMEs in the design review (*Cause*), the design may not meet stakeholder expectations (*Risk*) and may lead to poor quality and limited usability. (*Effect*)
- There have been 3 instances in the company of the back-up system failing in the last 3 years. No changes are anticipated during the project. (*Cause*) So the recovery system, if needed, may not work (*Risk*) causing the project to lose work product and objects developed to date. (*Effect*)

As you can see, these are much clearer on what the risk is and make it easier to develop contingencies to avoid or mitigate them. We will get more into that in [Chapter 6](#).



Don't forget about the opportunities! Because this product is based on Service Oriented Architecture (*Cause*) other applications may be able to use the "service" (*Opportunity*) saving the company money on future development. (*Effect*)

3.2.2 Identify General Project Risks

You want to approach risk identification from a number of directions. Perhaps, start with a brainstorming session. Then, create risk categories and see if you can't identify more risks by working through the risk breakdown structure. Finally, step through the WBS to see if the stakeholders can identify any risks by looking at specific activities or if you need to add activities because of risks previously identified in other areas.

There are two primary methods of documenting risks; sticky notes and forms. Sticky notes tend to be more flexible and usable throughout the whole risk process. Forms help provide a level of structure and combined with a laptop/projector can significantly reduce the time it takes to complete the process. Table 2 is a sample form that lists the key data to be determined during the risk identification phase. The shaded areas are part of the next step, qualification. However, often projects will combine identification and qualification. This works well in smaller, less complex projects where you can have all of the right people in the room during the identification process. However, in larger, more complex efforts we recommend you focus first on identification and then perform the analysis. To get the best of both worlds, you can find pre-built sticky notes with similar categories that could help simplify your processes.

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Table 3 shows an example of a risk breakdown structure. A risk breakdown structure is just a hierarchical manner to view your risks. You would start at Level 1 and use one of the gathering techniques such as brainstorming to come up with Level 2, and then work to Level 3, which are more specific risks.

You can find a list of potential risk categories in [Appendix D](#). Choose the categories that are appropriate for your project.

Table 2: Elements to be gathered during Risk Identification

Risk Event: A short description of the risk event		Source: Name of person identifying risk
Activity/Task (WBS element)	Description: A detailed description of the risk event.	Trigger: Early warning signs that a risk has occurred or is about to occur.
		Occurrence: When and how often the event might occur
Probability	Impact	Score



A good technique for documenting risks during the identification stage is to write each risk on a lined 3"x5" sticky note. This allows you to quickly add additional details as they come up and move them around to sort and organize them better. If you are using a "war room" in your project, you may find it helpful to post everything on the wall. You can use flip chart paper to identify your categories and place each risk under a category.

Table 3: Sample Risk Breakdown Structure

Level 0	Level 1	Level 2	Level 3
Project Risk	Technical	Analysis	Design incomplete
			The technology associated with this project is uncertain
		Design	Need for design exceptions
			Unexpected technical issues
		Build	Inaccurate assumptions on technical issues in planning stage
		Test	Change requests because of errors
	External	Deploy	Unreasonable systems performance
			Staging areas
		Federal	Political factors change
			Governmental acts

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		State	Funding changes for fiscal year
			New stakeholders emerge and demand new work
		Agency	Priorities change on existing project
		Other	Acts of God
			Acts of Terror/War
	Environmental	Staffing	Lack of specialized staff
			Resources affected
		Regulatory	Project does not conform to the EA standards
			Hosting Waiver denied
			New permits or new information required
	Organizational	Management	Reviewing agency requires higher-level review than assumed
			Complex internal funding procedures
			Priorities change on existing program
			Lack of upper management support
			Internal red tape causes delay getting approvals, decisions
		Team	Inexperienced staff assigned
			Losing critical staff at crucial point of the project
			Functional units not available or overloaded
	Project Management Risks	General	Change in key staffing throughout the project
			Communication breakdown with project team
		Scope	Insufficient time to plan
			Project purpose and need are poorly defined
			Too many assumptions in defining and estimating the work
		Schedule	Project scope definition is poor or incomplete
			Work dependencies not clearly identified
			Delay in addressing and solving problems
			Labor productivity issues
			Estimating and/or scheduling errors
			Lack of close coordination with other linked projects
		Cost	Tasks are completed ahead of schedule
			Cost escalation
			Lack of contingency fund
			Hardware costs are less than planned

3.2.3 Identify Risks by Task

Your general risk identification process probably highlighted some specific tasks that have significant risk and need further investigation. Many times those are the only tasks analyzed. As a result, some other major risks go unidentified. The best way to avoid missing major risks is to step through each work package in your WBS and identify what the risks are associated with them. For larger projects, this can be a fairly significant effort, but the rewards are significant as well. One thing you will learn is where to apply the general risks within your project. For example, losing staff will have an impact to the project, but it is often impossible to develop a contingency for every project team member. By stepping through the WBS you can identify where specifically this general risk applies and narrow down to a manageable level the list of people you will need contingency plans for. Tying specific tasks to risks will also be very important later on when you are quantifying your risks.



Often one of the hardest parts in risk management is to get people to talk about it. Be prepared to ask specific questions regarding your project's tasks to draw everyone into the conversation. Even if you think you know the answer, ask the question. You gain in two ways by doing this. First, you confirm (or change) your thoughts and understanding of the task. Second, if the team brings it up, they automatically gain buy-in and that is very important for successful risk management.

3.2.4 Know when you are done

So how do you know when you are done? Unfortunately there is no definitive rule. You can base it on a gut feel. You can stop when silly. You can have the team rate how comfortable they feel that all the major risks have been identified.

Before moving on, ask yourself some key questions:

- Did we include everyone we needed?
- Do we understand the identified risks enough to qualify them?
- Have we really put in the effort required?
- Is it worth doing more identification?



Did you identify risks in your procurement process? What if there is a delay in the review of the RFP by OMB, the AG or ITD? What if it takes two weeks for them to review your contract? What if your procurement is protested?

3.2.5 Know when you are done

Create your risk list Finally, take all of your risks and organize them into a risk list. This is just simply a list of all the information you have gathered to this point. You can find a sample risk list in [Appendix C](#). The last three columns of the sample list (Probability, Impact and Score) are for qualifying risks. We will cover that in the next chapter.

3.3. Identification Techniques

Purpose

There are a number of methods used to perform risk identification. What we have done is summarized each technique, provided some guidance on when that technique is most appropriately used and then provided more details on how to perform the technique as an appendix.

Techniques

Affinity Diagram – is a process often used to group risks into categories. It often leads to discovering additional risks. You generally will want to combine this technique with other techniques. It can also be a fun exercise for everyone. You can find detailed instructions on how to do an affinity diagram in [Appendix E](#)

Brainstorming – is a technique that allows you to generate a large number of ideas relatively quickly. The team members verbally identify risks and provide the ability to build on each other's ideas. It is

essential to select participants that know the topics discussed, you provide relevant documentation and a facilitator leads the group. The downside is that one or two people can dominate a session. To help overcome that, you can use mix in some of the **Nominal Group** techniques discussed below. You can find detailed instructions on how to perform a brainstorming session in [Appendix F](#)

Delphi – is a technique where you develop lists of questions and pass them out to seek out risk in a particular area. All of the experts you query remain anonymous. You then send out the results for comment and keep looping it until you form a level of consensus. This technique is useful to keep one person from dominating others, minimizes the bandwagon effect, and allows them to admit errors in previous judgment without any stigma. A constraint with this method is that people do not like to complete surveys and may not return the information in a timely manner or may not provide accurate information. This technique is a hands-off process with no insight into the caveats that go with the answers. You can find detailed instructions on how to perform the Delphi Technique in [Appendix G](#)

Fishbone (Ishikawa) Diagram – is also known as a cause-and-effect diagram. This is a technique that people typically use when looking at quality, but may be useful in identifying general risks. Use this technique to explore a general risk into more specific risks. The downside of this technique is that you can quickly become bogged down in the details. You can find detailed instructions on how to use a fishbone diagram in [Appendix H](#)

Interview – is an effective way to obtain risk areas. The interview process is inherently a questioning process. Once you have gathered your list of risks, you should provide the list to all the participants for comment before you add them to the risk list. It is limited by the effectiveness of the facilitator and the questions that are asked. You also lose a lot of ability to build off other's ideas. You can find detailed instructions on how to perform an interview session in [Appendix I](#)

Nominal Group – is a structured brainstorming technique, where each group member presents an idea in turn. This can be used to ensure participation by all group members. You can find detailed instructions on how to perform a nominal group session in [Appendix J](#)

Pre-Mortem – is a technique similar to brainstorming. However, you approach things a bit differently. With a pre-mortem, you explain that you have just completed or terminated the project and it failed to meet one of its objectives. The group is asked to determine why the project failed. This technique won't identify all of the risks you need so you will need to combine it with other techniques.

SWOT – is a technique used to analyze the project from the perspective of each project's Strengths, Weaknesses, Opportunities and Threats. You can use this technique to identify key internal and external factors used in determining whether you can achieve a project's objectives. More often, you will find it useful when examining specific risks and responses. You can find detailed instructions on how to perform a SWOT analysis in [Appendix K](#)

3.4. Conclusion

Risk Identification is one of the most important steps in the risk management process. You and your team should look for a number of risks to the project. Some may be pretty specific, and some may be more general. There are a number of techniques you can use in gathering the risks. You probably need to use more than one. For example, you may start out doing a brainstorming session, and then use the Delphi technique to refine some of them and use a Fishbone session to work out some details on one specific risk.

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Start by reviewing the information available, including the Risk Management Plan, the WBS, the project management archives and your PMO and EPMO's. Next, gather your project team and SME's and generate your risks. Finally, document all of your risks into your risk register. Now you are ready to evaluate and prioritize the risks. That process is covered in our next chapter, Qualitative Risk Analysis.

Chapter 4: Qualitative Risk Analysis

Purpose

Qualitative risk analysis is the subjective analysis of the risks on a project. You perform it to get a consistent and repeatable approach used to produce a sequenced list of risks, ordered by perceived severity. After assessing impact and probability, you are able to calculate an overall risk score and sort the highest risks to the top of the list. This will provide a list of risks to examine more thoroughly. Quantitative risk assessments allow the project to:

- Organize the identified risks in the order of the danger to the project
- Prioritize which risks are worth going further in the process so that you spend time on only those that matter most
- Identify how many significant risks there are to the project

Process

There are four primary steps to risk qualification:

4.1 Review current information and prepare for analysis

4.2 Review the risks, test assumptions and perform the assessment

This includes going through each risk and individually determining the probability of occurrence and the impact if it does occur.

4.3 Calculate the risk scores and the overall project risk score

4.4 Sort the risk register by the risk score and determine which risks will move into the next phase

4.1 Review current information and prepare for analysis

Purpose

Good preparation tends to give you a better result. If you watch any cooking shows on TV, you will notice that often the chef has all his ingredients premeasured in separate containers. This is to help speed up the process and reduce the chance of errors occurring. In the same way, this step makes sure you have all of the important risk qualification ingredients available and ready for analysis.

Tasks

4.1.1. Review current available information

Start by taking a look at what you have and make sure you are comfortable with the amount of information available. Key elements to review are:

- The list of identified risks from risk identification exercise
 - What assumptions have been made regarding the risks?

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- How well is the risk understood?
 - What is the extent of understanding?
 - What data is available about the risk?
 - What is the quality of the data?
 - What is the reliability and integrity of the data

4.1.2. Confirm the right risk matrix

You normally choose your matrix during the planning process. There are a number of risk matrixes available. You need to confirm the one chosen during planning still fits best in your project. They range from a simple “High, High/Medium, Medium/Low” scale to a complex scale that takes frequency and time of impact into account.

The High/Medium/Low matrix, like the one below, works fine for very small, simple projects.

Table 4: Limited Risk Matrix

Probability	Impact		
	Low=1	Medium=5	High=10
High=5	5	25	50
Medium=3	3	15	30
Low=1	1	5	10

The following matrix should work for most projects and is the recommended matrix for state government projects.

Table 5: Recommended Risk Matrix

Probability	Impact				
	Very Low=1	Low=3	Moderate =5	High=8	Very High=10
Very Likely=5	5	15	25	40	50
Probably=4	4	12	20	32	40
Maybe=3	3	9	15	24	30
Low=2	2	6	10	16	20
Very Unlikely=1	1	3	5	8	10

Notice in both tables the Impact is scored higher than the probability. This provides weight to the impact part of the score. This is because you want to focus your limited resources on those items that have the greatest potential impact.

The next section contains a list of ranges and values that can help you determine where a risk falls in the matrix.

If you need a more complex matrix, [Appendix K](#) provides a matrix that contains a timeframe element.

4.2. Review the risks, test assumptions and perform the assessment

Purpose

Finally, it is time to put some numbers to the paper. There are many ways to go about performing analysis. Sometimes the PM uses the information gathered to develop the first cut at the scoring.

Other times, you will re-establish the identification groups to assist in the process. The PM will make this choice based upon the scale and complexity of the project. The larger and more complex the project, the more you will want others' input in putting the risk score together. As you will see, this is still a subjective scoring process using expert opinion to develop a score.

Tasks

4.2.1. Score the Risks

Open your risk list (or register) and begin at the top. You are working on the probability, the impact, and the score columns.

Probability	Impact	Score
-------------	--------	-------

Note: The look may differ depending upon the list/register style used.

Probability

Risk probability relates to the probability of the risk occurring. There are a number of ways to determine this, but we recommend using a table like the one below to come up with your probability.

Table 6: Probability of Occurrence

Probability range	Natural language expression	Probability value used for calculations	Numeric score
86% through 95%	"Very likely" to occur	90%	5
61% through 85%	"Probably" will occur	73%	4
36% through 60%	"May occur" about half of the time	48%	3
11% through 35%	"Unlikely" to occur	23%	2
1% through 10%	"Very unlikely" to occur	5%	1

The probability range is the percentage estimate that the risk will occur. The natural language expression may be how someone would rate the probability. The probability value is the number used to calculate value. You won't use the probability value until the next chapter, Risk Quantification. Finally, the numeric score is the number used in the matrix to calculate your risk score. Enter this number into your risk list.



If the probability of a risk is greater than 95% then it should not be treated as a risk, but should be managed assuming the event will occur. Risk management is intended to manage and control uncertain events and anything falling into this category really isn't very uncertain.

Impact

Calculating the impact of a risk is often a lot harder than calculating the probability. There are a number of factors that you should consider. The best place to start is the impact to cost and schedule. The table below may help you determine the value you will want to use.

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Table 7: Risk Impact

* These examples are simply “rules of thumb”. You should adjust them according to your specific project needs.

Impact range	Natural language expression	Numeric score
An event that, if it occurred, would cause project failure (inability to achieve minimum acceptable requirements)	Very High	10
An event that, if it occurred, would cause the project to be over budget by 40% or project delayed by 40%		9
An event that, if it occurred, would cause the project to be over budget by 30%-40% or project delayed by 30-40%	High	8
An event that, if it occurred, would cause the project to be over budget by 20%-30% or project delayed by 20-30%		7
An event that, if it occurred, would cause the project to be over budget by 10%-20% or project delayed by 10-20%		6
An event that, if it occurred, would cause the project to be slightly over budget or a minor schedule delay	Moderate	5
An event that, if it occurred, would cause the project to have a large reduction in cost or time reserves but remain within budget		4
An event that, if it occurred, would cause the project to have a medium reduction in cost or time reserves but remain within budget	Low	3
An event that, if it occurred, would cause the project to have a small reduction in cost or time reserves but remain within budget		2
An event that, if it occurred, would have no real impact to the project	Very Low	1

Keep in mind that you can adjust the examples to better fit your project. On small projects, even a shift of one week could be critical. Also, these may need to be adjusted depending upon which matrix is used. As you can see in our recommended scoring, we put more weight on impact than probability. For simplification, we recommend just using the highlighted scores when entering the probability score

into your risk list (i.e. Low =3, Mod=5, High=8, Very High=10). The more detailed numbers would only be used if you need to further prioritize the risks.

4.3. Calculate the risk scores and the overall project risk score

Purpose

You want to determine what risks are important enough to warrant further work and filter out those risks that aren't going to matter as much. This is the first opportunity to do that filtering.

Tasks

4.3.1. Score the Risks

If you are using the sample risk list spreadsheet, your score should automatically calculate for you. (You may need to copy the formula into additional pages.) If you are using something else, you can simply use the chosen risk matrix to determine the risk score. Or you can multiply the risk probability score with the impact score to come up with the risk score.

So, using the recommended matrix (Table 5), if you had a risk that had a probability of "probably" or 4 and an impact of "High" or 8, then the risk score would be $4 \times 8 = 32$.

Perform these steps for each identified risk.

4.4. Sort the risk register by the risk score and determine which risks will move into the next phase

Purpose

By sorting the risks from those with the largest risk score to those with the smallest risk score, you automatically prioritize the risks, allowing you to begin the process to determine which risks will warrant further review.

Tasks

4.4.1. Sort the Risks

Now that you have a score for each risk, sort them in order of highest to lowest. This should bring the risks that need further investigation to the top. It wouldn't hurt to color code your risks in a similar manner found on the matrix. (You should at least do the reds, oranges and yellows.)

4.4.2. Review Scoring

Once the risks are sorted, take a look at them. Do any seem out of place? If you performed the scoring by yourself, send the list out to the team and have them validate your analysis. Make adjustments that make sense and get consensus from the project team that the scores reflect the appropriate level of risk.

Generally risks with a probability greater than 95% are considered "true" and so are removed from the risk category and are handled as assumptions that need to be dealt with in the project.

4.5. Conclusion

Qualitative risk analysis is the subjective analysis of the risks on a project. It allows you to provide a consistent process to produce a list of risks in order of severity. This chapter provided you with some tools to help determine the probability & impact of each risk and helped you convert that into a numerical score. Once the risk list has been sorted from highest priority to lowest, you can take the next step, Quantitative Risk Analysis. We will cover this in our next chapter.

Chapter 5: Quantitative Risk Analysis

Purpose

The purpose of quantitative risk analysis is to use a process to numerically analyze the overall impact identified risks have on meeting project objectives. The quantitative risk analysis process includes the following:

- Determine which risk events warrant a response (this is an extension of the qualitative analysis)
- Determine overall project risk (risk exposure)
- Determine quantified probability of meeting project objectives
- Determine cost and schedule reserves
- Help prioritize and focus what risks require the most attention
- Create realistic and achievable cost, schedule and scope targets

I can't quantify, I don't have the software. Many people think that you have to have sophisticated software in order to perform quantitative analysis. While it is needed in order to perform certain functions, there is actually a lot you can do to quantify the risks just using a simple calculator.

So why do we need to do this anyway? Aren't our estimates "good enough"? Well for some projects they may be. However, most accountants and senior executives want more in-depth analysis before approving additional funding. Quantitative analysis will provide that to them. Plus, this will allow you to determine how many risks you need to perform response planning for. It will also make response planning easier.

Process

Risk Qualification gives project managers a good feel for what are the big risks they need to be aware of and watch out for. But in order to start planning risk response, we need to dig a little deeper, to really evaluate the impact that each risk has on the project. Risk Quantification is the stage that is going to identify how much risk contingency you need to plan for and provides the analysis for management that shows you are not just asking for a pot of gold, but really have done your best to develop a solid justification on why you are asking for that contingency.

This effort consists of the following processes:

5.1 Prepare for Analysis

- Identify high items coming out of qualitative process
- Review Risk Management Plan
- Review Project Management Plan

5.2 Perform Analysis

- Improve Probability Estimates
 - Determine probability distribution

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- Gather Three-Point Estimates
- Improve Impact Estimates
 - Perform Decision Tree Analysis
 - Perform Expected Monetary Value (EMV) Analysis
 - Perform Sensitivity Analysis
 - Perform Simulation

5.3 Update Risk Register & Create Risk Reports

- Develop a prioritized list of quantified risks
- Develop the total risk score for the project
- Documented list of non-critical, non-top risks
- Develop a list of the possible project completion dates and costs with their confidence levels (*This task is possible if you used simulation software.*)

The number and types of processes in this chapter that you use will vary widely from project to project. Some tasks are only possible if you have specialized software available. However, even just performing some of the basic items noted above is going to give you a solid foundation for developing your risk budget.

5.1 Prepare for Analysis

Purpose

As with most project management activities, preparation is important to success. In this step, the project manager gathers and reviews all of the materials needed to perform the risk quantification analysis.

Tasks

5.1.1 Identify high items coming out of qualitative process

If you try to do detailed analysis on all risks identified on a project you could easily spend all your time analyzing risks and never get around to actually executing the project. In the qualitative process, you did some rough estimates and prioritized your list of risks from the most important and most likely to occur to the least. Now you need to determine which tasks need to have more detailed analysis done.

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Table 8 is a copy of the table discussed in Chapter 4.

Table 8: Risk Matrix

	Impact				
Probability	Negligible=1	Minor=3	Moderate =5	Serious=8	Critical=10
Very Likely=5	5	15	25	40	50
Probably=4	4	12	20	32	40
Maybe=3	3	9	15	24	30
Low=2	2	6	10	16	20
Very Unlikely=1	1	3	5	8	10

So, you will want to start your quantitative analysis with those risks that have the highest score (red). Once you work your way through the risks in the red category, you want to work on the next category (orange), however, you may not spend as much time or attention to detail as you did with the red risks. The yellow risks fall into a grey area. As a PM, you need to decide if quantifying those risks is worth the effort. Most likely you will want to do some analysis on them probably performing less work and detail than the level above.

Finally, skim through the green-scored risks for any that jump out as needing additional attention. If you plan on using a formal risk register, now is the time to move them. This can give you a cleaner list to work with and provide space for all the information you want to attach to the risk (including space for risk response, the next step in the risk management process). It should help you focus on just those risks that need additional attention.



It is still important to have all of the risks (including the low risk/low impact ones in your risk list so you can actively monitor for them. So don't throw away your risk list or think all that work was wasted.

As with all of project management, it is up to the project manager to use his or her best judgment on what level of detail is appropriate for the specific project they are working on.

5.1.2 Review Risk Management Plan

Roles and responsibilities for conducting risk management activities, risk budget and schedule risk activities all play an important part of quantitative analysis. You should be starting to put together a list of individuals who will need to be involved with the analysis.

5.1.3 Review Project Management Plan

The project cost management and schedule management plans are important data to have available during analysis. The project manager needs to have this information readily available when facilitating risk quantification discussions.

5.2 Perform Analysis

Purpose

You need to perform a number of tasks in order to develop a strong, objective analysis of the risks potentially impacting the project. Not only do you need to be prepared to discuss the technical impacts

of the risk, but you also need to bring the business side in to discuss the potential impacts to the organization's business.

The best way to perform this is to talk to the people that can help you dig deeper into the probability of the risk occurring and what impact it would have both to the project and to the business of the agency. You will want to gather information that will assist you in creating the probability distributions, and three point estimates (discussed in more detail below). You may also want to tap some expertise outside of the project team such as financial or statistical experts to help validate your data and techniques. Sometimes this will be one-on-one and sometimes you will want to bring small groups together.

Tasks

In the risk qualification process you and your team estimated the probability of a risk happening. This is usually just an expert opinion or best guess. But for the risks you need to perform quantification on, you want to better define those numbers. You want to move from a probability of rating of High (4) to a 75% chance of occurring. There are a number of ways for you to better define your estimates. You may need to use more than one depending upon the activity and risk event you are evaluating.

You normally want to analyze both schedule and cost impacts. There are four common methods to perform this analysis. You would not typically use all of them on any given risk, but you may use different ones for different risks. If you have simulation software, the product will generally create all of the other items for you.

One of the biggest difficulties for project managers is to get funding to cover risks. It is the detailed analysis described below that is going to give you the best chance at giving management a compelling argument for funding your risk contingency. It will no longer seem like you are just asking for a pot of money, but they will be able to see the analysis and math behind the process and you will also be able to better show them the possibilities should they not fund your risk budget.

5.2.1 Program Evaluation and Review Technique (PERT)

One common risk is the mis-estimation of schedule/cost. One of the best methods of improving estimates is by using PERT. You can use this for both schedule and cost.

Work with the experts to determine the Optimistic, Most Likely, and Pessimistic values for the cost/schedule for each of the identified high-risk activities. It is also important to document some of the reasoning behind the ranges.

Now that you have gathered a lot of information, it is time to put it to use.

You can use the PERT formula to improve the duration estimate. The formula is as follows:

$$\frac{P + 4ML + O}{6}$$

So if your worst case scenario for a task is 20 days, the task usually takes you about 12 days and the fastest it has ever been done is 8 days, then it should work out like this:

$$\frac{20 + (4 \times 12) + 8}{6} = 12.67$$

When you round up, you will want to add a day to the task. This may not seem like much, but if you do this to just 20 tasks out of thousands, you could add a month to your schedule. This also gives you a proven mathematical calculation should someone question your duration estimate.

So now you can build risk into the activity by changing your schedule duration to 13 days.

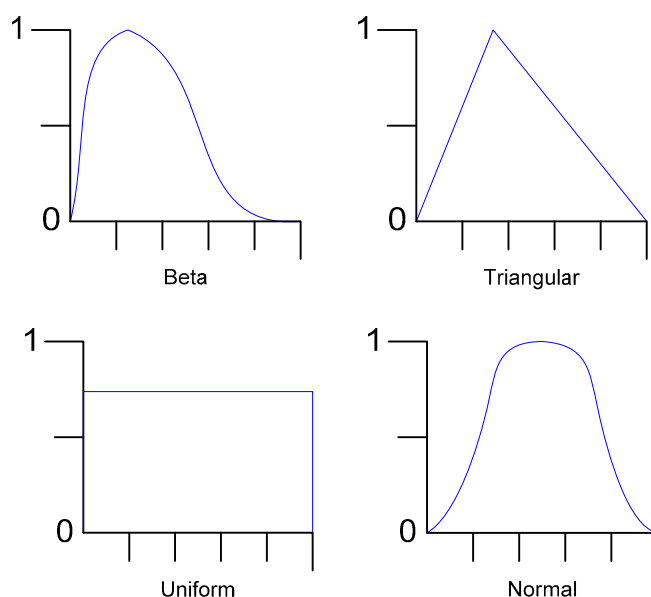
If you are going to use simulation software, you will want to keep the three estimates. The software will use them to calculate the possible schedule for each iteration it runs.

5.2.2 Probability Distribution

If you want to improve your estimates on the probability of a risk event occurring, you can perform some statistical analysis using probability distribution.

Probability distribution represents how you can apply “uncertainty” to a given task or a set of tasks. In other words, you can decide the range of occurrence and the probability it will fall within that range. You can see some common types of probability distributions in Figure 1.

Figure 1: Common Distribution Methods



Most people are familiar with the Normal or “Bell Curve” distribution. In our case, this would indicate that there is a large chance that risk will occur very close to our estimate (the large area close to the top). There is a lesser chance that will occur significantly different from our estimate. In project risk analysis, the beta and triangular distributions are often used because both of these indicate that people tend to underestimate rather than overestimate.

For example: You may have estimated that if a risk occurs, it will take 10 additional days to complete a task. If you use a Normal distribution method, there is a large percentage of time that it will take 10 or so days, but there is some percentage of time that it will take less than 8 or more than 12 days and that percentage is equal on either side. With the Beta and Triangular methods you are more likely to take more days than fewer days.

You can find more information on how to use MS Excel to calculate beta distributions at <http://www.xycoon.com/beta.htm>.

If you plan on using a simulation program, you will be able to apply the distribution method for all project activities that you haven't used the PERT method in your original estimation process.

5.2.3 Expected Monetary Value (EMV) Analysis

Once you have defined the probability and cost of a risk event, you can now calculate how much you need to add to your risk contingency fund. You can do that using Expected Monetary Value (EMV). For simple risks or small-scale projects you could simplify this to multiplying the probability of occurrence with the impact in dollars. For example, if the risk had a 35% probability of occurring and if it did occur, would cost the project \$2000, the $EMV = 35\% \times \$2000 = \700 . This is how much you would add to the risk pool.

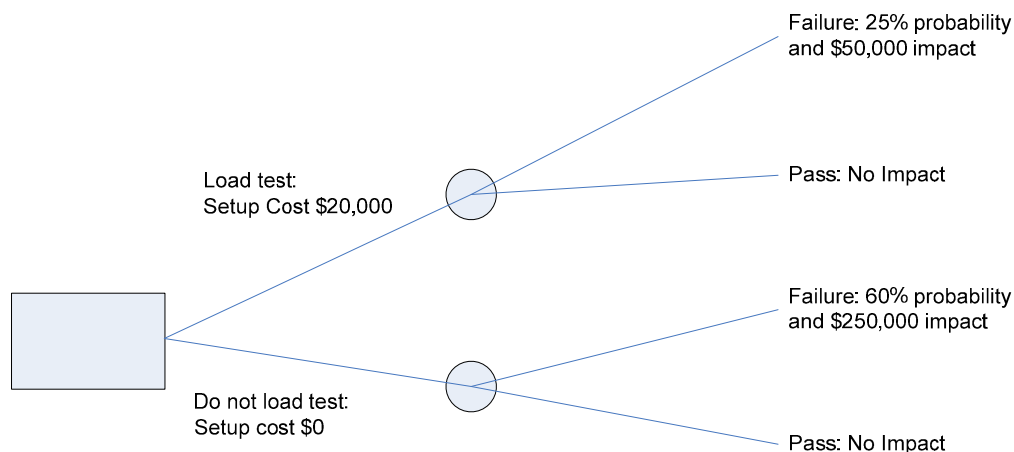
For larger projects or more complex risks, you probably will want to pair this analysis up with some other techniques like the ones below.

5.2.4 Decision Tree Analysis

You can use a decision tree analysis to detail out a particular risk event.

You can see a simple decision tree analysis in Figure 2. In this example, if you look just at setup costs, not load testing the application could lead to significant savings (\$20,000). However, the analysis shows that decision may be unwise and that it is actually cheaper to go ahead and load test.

Figure 2: Simple Decision Tree



In the table below, you can see how you can use EMV calculations to determine the best direction to take in your decision tree. As you can see, we said the probability of failure with load testing in place was 25% and we multiplied that by the estimated cost should we have to back up due to load failure. This comes to \$12,500. Then we add the original cost of the load test setup (\$20,000) for a total cost of \$32,500. On the other branch, a 60% probability of failure times the impact of \$250,000 comes to a total cost of \$150,000.

Table 9: Sample EMV Calculations

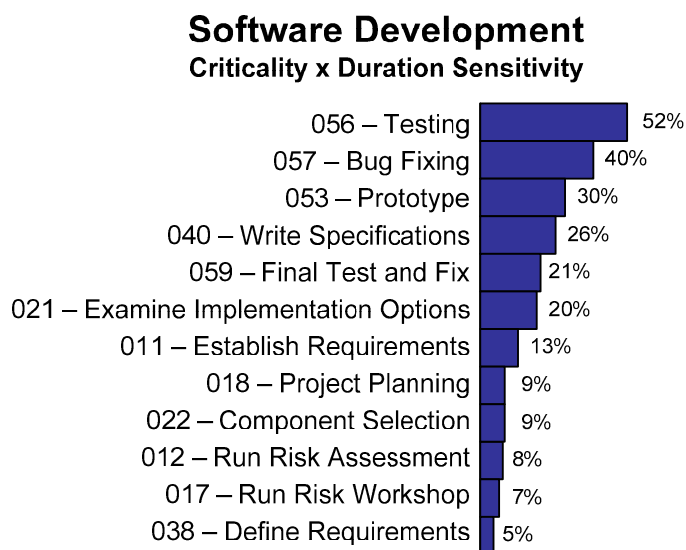
Load Test	$25\% \times \$50,000 = \$12,500 + \$20,000 = \$32,500$
Do Not Load Test	$60\% \times \$250,000 = \$150,000$

Now you are ready to go to management with some recommendations. You can give them the choice of adding a \$20,000 task to do load testing and only putting \$12,500 into the risk fund or putting \$150,000 into the risk fund.

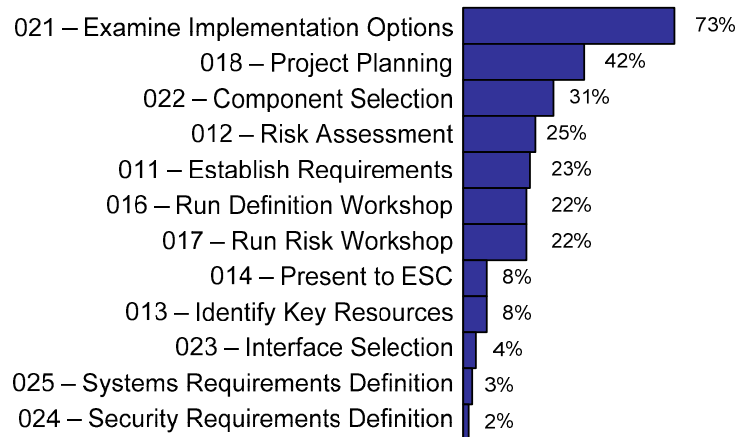
5.2.5 Sensitivity Analysis

Sensitivity analysis will help you determine which risk has the most potential impact to the project. With this analysis you can examine possible alternatives and contingencies to mitigate a risk.

A common display of this is using a tornado diagram. You can use these in a variety of ways. You can look at the criticality of a portion of the project as shown in the first example in Figure 3. Or you can look in-depth at a specific task as seen in the second example.

Figure 3: Tornado Diagrams

Software Development **Duration Sensitivity: Predecessors of 032 – Infrastructure Complete**



Most simulation programs will produce these automatically, but you can produce them manually using MS Excel or some other charting software if necessary. You can find a good explanation on how to do sensitivity analysis using spreadsheets at http://msl1.mit.edu/rdn/d_table.pdf.

5.2.2.1 Simulation

The downside of most of the above techniques is that there is still a lot of “subjectivity” to the analysis. What is really the probability that something will occur? That is where simulation software comes into play. Most state agencies do not currently have simulation software available.

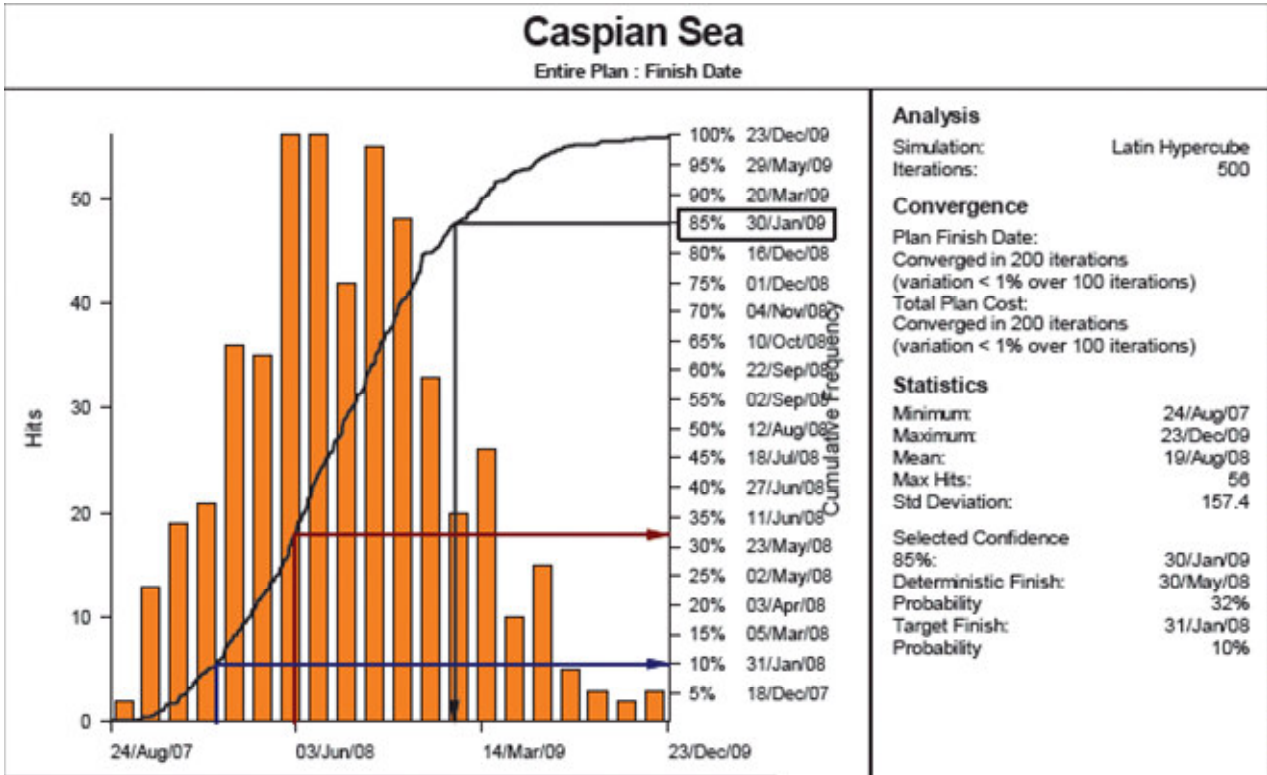
Simulation software essentially takes your project, allows you to input your risks and probability distributions and then will run the project using those parameters 500, 1,000, 10,000 or more times. This will give you a much more accurate probability estimate of things occurring. The nice thing is, most of the software packages available automatically calculate and chart all of the types of analysis discussed earlier. All the PM needs to do is present the data.

Most packages deliver other reports as well, such as histograms.

Histograms will show the percentage likelihood that you will achieve your budget and schedule. It can also tell you what date or dollar amount you would want if you wanted to come in at a particular probability. For example, Figure 4 shows that there is a only a 32% chance to hit our current target completion date of May 30th. If we want an 85% probability to meet our end date, we would need to set the date to January 30th of the following year. (One part of the functionality of this part of the software is that you could accept the new date and it would change the appropriate tasks in your schedule.)

You can use MS Excel to calculate the probability of a task completing on time, but for large complex projects the time needed to do this would be prohibitive. You can find more information about using MS Excel and PERT to develop that probability at <http://laserlightnetworks.com/Documents/Model PERT Project Schedules with the BETA Distribution using EXCEL.pdf>.

Figure 4: Sample Histogram



Sample reports by Pertmaster Ltd. ©2006. Used with permission

Some software will also provide a general analysis of the project schedule looking at things like open-ended tasks, percentage of tasks on the critical path, out of sequence links, and negative lags.

GIGO – Garbage In, Garbage Out. Your reports are only as good as the data you used to generate them. If you use poor 3-point estimates or don’t define realistic probability distributions, the information you provide based upon that data will also be poor.

5.3 Update Risk Register & Create Risk Reports

Purpose

Now that we have developed more information, it is time to update the risk register. This is primarily the project manager’s responsibility with input from the project team. With detailed risk amounts, you will be able to re-sort the register with secondary criteria of risk costs. You will also be able to forecast the potential project costs and schedule, possibly identified some trends in risks and will have a documented list of non-critical risks. If you had the opportunity to use simulation software, you could use the histogram (described above) to list the possible project completion dates and costs with their confidence levels, and show the probability of achieving the required project cost or schedule objectives.

Tasks

5.3.1 Develop a prioritized list of quantified risks.

First, you want to add the quantification information into your risk register. Figure 5 is a limited view of the Risk Register found in [Appendix B](#). You will want to enter the Cost and Schedule Risk quantification data and any special comments that pertain to that information (areas highlighted in pink). Comments could include the basis for the numbers used in the quantification.

Figure 5: Quantification Section of Risk Register

Risk-Probability	Risk-Impact	Risk-Score	Cost-Risk-Quantification	Schedule-Risk-Quantification
3	8	24	\$30,000	2-Weeks
Quantification-Comments				
Cost-basis = 50%, \$60,000 impact Schedule-basis = 50%, 160 hrs				

5.3.2 Develop the total risk score for the project

Once you have entered all of the information into the register, add up all of the cost and schedule data. This will provide you with the initial risk contingency fund and schedule contingency. This data might change based on your response & contingency plans. We will cover that in the next chapter. One easy way to determine your project's overall risk score is to create a table like the one below.

Risk Score for Project ABC	
Risk ID	Project Risk Score
1	32
2	40
5	24
14-Opportunity	-24
25	20
26	40
47	30
Average risk score for the project	23

This score gives senior management a general feel for how risky the project is and something to compare other projects against.

5.3.3 Documented list of non-critical risks

This is the risk list after you have moved all of the top risks to the risk register. This list will still be important for monitoring risks in your project and for historical purposes. What may be a low risk in this project could be a high risk in another. Your list can provide valuable input to your next project.

The following task is only possible if you used simulation software.

5.3.4 Develop a list of the possible project completion dates and costs with their confidence levels

Using the histograms created by risk simulation software, create a list of completion dates and the costs associated with those dates. Include the confidence level of achieving those dates and present the information to management. Give them the information to choose how much risk they are willing to accept and how much contingency they are willing to give you.



Beware Analysis Paralysis

You've identified risk after risk, you have 40 fishbone diagrams, it has taken 8 weeks and you still have a ton of risks to go. STOP!!!! If you have that many high priority risks, you likely have other issues as well. If you are trying to quantify all risks, you can quickly reach a point of diminishing returns. Don't over analyze the project.

Now let's tackle each problem in turn, starting with the most likely one.

Problem: A lot of high-ranking risks

Solution: Go back and reexamine your scope. Maybe focus on a smaller piece.

Present your concerns to management. Perhaps this project shouldn't move forward until some of the risks have been removed or mitigated. Remember, canceling a project is not a failure. Canceling a project that should have been canceled months before and thousands of dollars earlier is a failure.

Problem: Quantifying all the risks

Solution: As mentioned above, you will reach a point of diminishing returns. Why spend hours quantifying a \$500 risk item? Work with your subject matter experts to decide how deep into the risk list you need to go.



On the other side of the coin not quantifying any risk doesn't work well either. This leaves the project vulnerable to the bane of all managers – surprises. Properly quantified risks provide a good basis for your risk contingency budget and schedule. Without this, you are left with high-level estimates of total risk costs. Very few projects get funding to cover 100% of all possible risks.

5.4 Conclusion

The purpose of quantitative risk analysis is to use a process to numerically analyze the effect of identified risks on overall project objectives. This will help us meet the following objectives:

- Determine which risk events warrant a response (this is an extension of the qualitative analysis)
- Determine overall project risk (risk exposure)
- Determine quantified probability of meeting project objectives
- Determine cost and schedule reserves
- Help prioritize and focus what risks require the most attention
- Create realistic and achievable cost, schedule and scope targets.

You are now ready to determine responses to your risks. We will cover that in the next chapter.

Chapter 6: Risk Response Planning

Purpose

Risk response planning is a major phase in the project risk management process. The point of this effort is to develop options and determine actions to enhance opportunities and reduce threats to the project. You want to look for ways to prevent or mitigate the risks and improve or enhance any opportunities. How you handle individual risks will depend on the nature and severity of the risk in relation to the achievement of project objectives. The goal is to reduce risk in a cost-effective manner without compromising quality.

Process

The process for risk response planning includes the following steps.

6.1 Identify and Assign Risk Owners

6.2 Develop Response Options

- Determine the options and actions to reduce the likelihood or consequences of negative effects on the project's objectives or increase/enhance opportunities.
- Develop response options including actions to be performed to mitigate/enhance and actions to be performed when the event occurs
- Identify secondary risks
- Choose option(s) to employ for all prioritized risks

6.3 Update Risk Register

6.1 Identify and Assign Risk Owners

Purpose

Often, the project manager is not in the best position to identify when a risk occurs nor is the best person to respond when it occurs. So why would the PM own the risk? You want the risk owner to be the person who is best able to respond when a risk occurs. No matter how well you plan, no risk event occurs exactly how you anticipate. You need someone who can determine what response is the best, based upon the exact situation they are facing. A risk owner is someone responsible for watching for risk triggers and then managing the risk if it happens.

Tasks

6.1.1 Review Register and Enter Assignment

Sometimes risk owners are assigned earlier in the Risk Management process because of their expertise in a particular area. For those risks that have high-risk scores and still have not been assigned, you should start with looking at your risk register and seeing who identified the risk. Depending on the scale of the project, the project manager may take the first cut at this, but you may want to involve the whole risk team. You should always get the agreement of the person being assigned that they will take

responsibility for the risk. It often works better if people volunteer to own the risk than be assigned to do it.



Remember, you should only be doing this process with the high priority/high impact risks that you identified earlier.

6.2 Develop Response Options

Purpose

The risk owners now need to determine what to do about the risk. The risk owner does not need to do this alone. They can pull a team together to help, but they are responsible for ensuring the response plan is completed. The PMBOK provides these common strategies to risks.

Negative Risk

- Avoid – Performing an alternative action which does not contain the risk
- Transfer – Shifting the impact and ownership to a 3rd party
- Mitigate – Modifies the probability of occurrence or impact to reduce the effect on the project. You may still need to add funds to the contingency reserve for the amount of risk that isn't mitigated.
- Accept – No other action is appropriate or cost effective and risk needs to be added to the contingency reserve

Opportunities

- Exploit – Perform an alternate action to ensure the opportunity occurs
- Share – Shifting ownership to a 3rd party who is better able to exploit it
- Enhance – Modifies the probability or impact to increase the effect on the project. You may reduce your risk contingency as appropriate using the same formula you use to add to the contingency.
- Accept – No other action is appropriate or cost effective

The risk owners need to develop options to present regarding each risk and provide their recommendations.

Tasks

6.2.1 Determine the options and actions to reduce the likelihood or consequences of negative effects on the project's objectives or increase/enhance opportunities.

The first thing the risk owner wants to look for is if there is something that could be done to avoid a negative risk or exploit an opportunity.

Avoidance

What kinds of things can be done which would help ensure that the risk did not come into play? For example, if one of your risks is that your project is scheduled to go live over Christmas and

since many members of your project team are scheduled for vacation during that time of the year, tasks may not be completed on time or with the necessary quality required. One way to avoid this is to move the schedule out past the holidays so minimum tasks are scheduled during that time.

Note, this may not be possible, but the risk owner needs to explore several alternatives so the risk team and/or senior management can select the best choice for the business.

Exploit

In the same sense, the risk owner should first look for ways to ensure the possibility of an opportunity occurring. So look for ways in which you can eliminate the uncertainty.

If you can't avoid/exploit a risk, then the next thing you, the risk owner, wants to look for is if you can transfer or share the risk with a 3rd party.

Transfer

Transferring the risk is to make the risk someone else's concern. There are a couple of examples common to this. Take the risk that equipment purchased will be damaged in shipping and the project will have to buy new equipment. The easiest way to transfer this risk is to structure your contract with the vendor in a way that ownership for the product does not transfer until your staff inspects the product upon delivery.

Another common transfer technique is to purchase insurance. If your risk is that a fire could destroy your servers, insuring those servers so you have the money to replace them would be a way to transfer the risk. Keep in mind, this may not be the best answer, but the risk owner needs to develop a number of solutions to allow the team to choose the best one or combination of solutions. In fact, often insurance is only one part of the answer. You want to insure and do something to make the situation less likely to occur. We will cover that in the next section, mitigation.

Share

On the Opportunity side, you wish to look for ways to share the positive outcome in order to make the likelihood of occurrence greater. A common example in construction is bonuses. Often bonuses are offered if the construction completes ahead of schedule. In order to make it more likely that this will occur, the construction company may offer bonuses to its employees and subcontractors if the project comes in ahead of schedule.

The next area to examine is if there is any way to mitigate the possibility of the risk occurring.

Mitigation

So how can we reduce the likelihood of the risk occurring? In our example above, we have taken out insurance in case of fire in our server room. If we decide to install an inert gas fire suppression system, we can reduce the likelihood that fire destroys the servers in the first place. However, this may introduce additional risks that need to be identified and defined. This is called secondary risks and we will talk more about those a little later.

Enhance

On the opportunity side, we want to look for ways we can enhance the chance of the risk occurring. Let's say you have a couple of developers that work really well together and when teamed up, consistently turn in excellent work ahead of schedule. So instead of assigning them two separate tasks working in parallel, you assign both of them to work on each task serially, thus enhancing the chance that they will complete the task early.

There is one more response category to talk about.

Acceptance

Acceptance applies the same for both negative and positive risk. If there are really no reasonable ways to avoid, transfer or mitigate the risk, then we have to accept the risk. In fact, this is what we have done with all of the lower scoring risks that didn't make it to this stage. We have just accepted the risk that those events may occur and we are not going to take any action regarding them until they do.

6.2.2 Develop response options including actions to be performed when the event occurs

This generally applies to risks that you can't avoid. Should the risk event occur despite all we have done to mitigate or transfer, then how will we respond?

First we need to make sure we know what the triggers look like. Triggers are the signs and symptoms that indicate the risk event is occurring.

Next, describe the actions to be taken when the risk event occurs. This is known as the contingency plan. Your response should be based on a cost/benefit analysis (cost vs. expected effectiveness). The decision tree technique described in **Chapter 5** can also be an effective tool.

Depending upon the severity of the risk event, you may need to develop a number of response options. Remember, closing out the project is always an option if the risk event is severe enough.

6.2.3 Identify secondary risks

As mentioned before, sometimes solving one risk introduces another. You need to examine these secondary risks to make sure they don't cause more problems than they solve. You basically want to follow the same process used to identify, score and rank the original risk.

6.2.4 Choose option(s) to employ for all prioritized risks

As noted before, not all responses and contingency plans are viable alternatives. Some may even have to be escalated to the sponsor and executive steering committee to determine what is acceptable. In the end, all of the risks that have been prioritized to this level need to have the appropriate response(s)/contingency plan(s) in place, responsibilities assigned for each agreed-upon response, and a "due date" assigned where risk responses are time-sensitive. It doesn't do any good to buy insurance after the fire happens.

6.3 Update Risk Register**Purpose**

The risk register is the primary working document used during project execution to monitor and track risks. It needs to be maintained and updated on a regular basis. You will still want to review your risk

list on a regular basis to see if anything has changed to require they be moved to the register, but the register is the document the team focuses on because it contains those risks deemed most critical to the success of the project.

Tasks

6.3.1 Enter agreed upon options into the register

All of the options agreed upon in task 6.2.4 need to be entered into the risk register for monitoring. Generally, each risk owner is responsible for entering this information for their assigned risks and updating it as specific responses are put into play.

6.4 Conclusion

The purpose of risk response planning is to develop how to best avoid or reduce the impact of negative risks and exploit or enhance positive risks. We also had to plan what our response should be if the risk still happens despite all we have done. The choices we have are the following:

Negative Risk

- Avoid – Performing an alternative action which does not contain the risk
- Transfer – Shifting the impact and ownership to a 3rd party
- Mitigate – Modifies the probability of occurrence or impact to reduce the effect on the project
- Accept – No other action is appropriate or cost effective and risk needs to be added to the contingency reserve

Opportunities

- Exploit – Perform an alternate action to ensure the opportunity occurs
- Share – Shifting ownership to a 3rd party who is better able to exploit it
- Enhance – Modifies the probability or impact to increase the effect on the project
- Accept – No other action is appropriate or cost effective and risk needs to be added to the contingency reserve

Once you document these responses and the contingency plans in the Risk Register, the planning effort of risk is complete. In the next chapter we will cover how you should manage risk during the execution portion of the project.

Chapter 7: Risk Monitoring and Control

Purpose

The purpose of risk monitoring and control is to continually evaluate and manage the defined risks of a project by tracking them throughout the project's lifecycle and executing contingency strategies as needed. You will be using both the risk register (higher priority items with mitigation & contingency plans) and the risk list (complete list of all risks identified) during this phase.

Process

This phase consists of the following processes:

7.1 Review the risk register

You need to continually review the risk register watching for any risk triggers, identifying new risks, closing old risks and analyzing the risk scores.

7.2 Analyze and update risk mitigation and contingency plans

As the project progresses, often methods of mitigation and ways to react to the risks change. You need to keep the risk register current with these changes.

7.3 Execute risk mitigation and contingency plans

As risk events occur, you will need to deploy your plans and manage the situation.

7.4 Communicate with stakeholders regarding risk events

Communications is often one of the most important steps. Keeping everyone informed about active risk events will often result in improved responses to the risk.

7.5 Manage your budgetary reserves

You need to manage your risk reserve well. If you use up 90% of your reserve in the 1st third of the project, that won't leave you much when something occurs in the other two thirds.

7.1 Review the risk register & risk list

Purpose

The process of reviewing and analyzing items on the risk register and risk list to ensure the project team is keeping up the awareness of the project's risks.

Tasks

7.1.1 Look for risk triggers

Is there anything going on in your project that will cause one of these risks to occur? Is anything going on that is making one occur right now? Often the sooner a risk event is identified the less impact it has on the project. If a power supply on your production server starts to show the symptoms of failing, ordering a spare and having it on hand is going to lessen the impact when it does fail then waiting until it actually dies before placing the order.

7.1.2 Consider if there are any new risks that should be added

You can't think of everything the first time around. You should be constantly looking to see if something is occurring that could add a risk to your list. You may have identified the risk of a production server failing, but not thought about just the power supply. When the data center reports the initial symptoms to you, you may need to add this risk to the list and develop the response and contingency plans now.

7.1.3 Close out risks that are no longer applicable

Often risks are related to specific work. Once it is complete, the risk no longer applies. For example, let's say you have identified that there is a risk of being unable to negotiate a contract with the preferred vendor. Once you have a signed contract, this risk can be closed.

Don't forget to document any historical information regarding the resolution of the risk. In our example above, what were the sticking points during contract negotiation? What were the secondary risks that came out of the contract?

7.1.4 Re-assess the risks

Are all the risks on the list? Are they the right risks? Are their probability and severity rankings still appropriate? Are the response plans still valid, or can they be improved? Work your way through the whole risk list (not just the high priority ones) and update as appropriate.

7.1.5 Review risks both individually and in a team setting

The only way to keep risks from becoming issues is to think about them and discuss them regularly. Risk should be a regular topic at team meetings. Risk management doesn't work if you do it once then put it on a shelf.

7.2 Analyze and update risk mitigation and contingency plans**Purpose**

Now we need to ensure that all risk mitigation and contingency plans are accurate for the current project environment. We can ignore any risk that fell off our risk register, but we will need to perform analysis on any risk whose priority has risen up to the register.

Tasks**7.2.1 Define any new or revised risk mitigation and contingency strategies**

We start by reviewing each priority risk to determine whether recent actions suggest any new risk mitigation or contingency strategies, or any revisions are needed to existing mitigation or contingency strategies.

7.2.2 Assign specific responsibility to mitigation and contingency strategies

All risks need an owner assigned to them. The risk owner should be responsible to assign specific responsibility of mitigation and contingency strategies to someone. Make sure the people assigned are aware of their responsibility and have buy-in to the related risk strategies. If it is not assigned, it probably won't get done.

7.2.3 Be proactive

The point of evaluating risk is to be proactive. Try to evaluate your new risks and plan your contingencies as far in advance as is possible.

7.3 Execute risk mitigation and contingency plans**Purpose**

This section will cover the processes of implementing the risk mitigation and contingency plans when appropriate. You really do have two activities here. Risk mitigation are steps taken to reduce the likelihood of the risk occurring (or increasing the chance of an opportunity.) Contingency plans document actions that need to take place when a risk actually occurs.

Tasks**7.3.1 Perform the risk mitigation strategies.**

Risk owners need to perform any of the mitigation tasks identified in the risk register. Remember, if the strategy is to mitigate the risk, that means you are going to take some action (or have taken an action) to reduce the possibility of the risk occurring (or increase the possibility of a positive risk). You will also want to watch for secondary risks related to your mitigation strategy. Once a risk has been mitigated, you need to move to task 7.3.3 to identify how much risk is left, rescore it, and update the risk register.



There are some risks that are mitigated in the planning process. For example, if your mitigation strategy was to add money to the risk contingency fund, once the project plan with those funds is approved, mitigation has occurred and you need to perform step 7.3.3 below.

7.3.2 Perform the contingency strategies for each risk that is “active.”

During the life of the project, some risks will become active, that is the risk event will occur. The risk owner should perform the contingency strategy agreed upon for that risk. The risk owner should generally not need approval to perform the strategy because the options should have already been discussed and agreed upon and the risk owner should be the one who is the best able to decide which contingency to use. If the risk owner decides that something other than one of the agreed upon contingencies should be implemented, then they should follow the process that was agreed upon in the risk management plan.

Don't forget to monitor secondary risks that apply to your contingency plan.

Once a risk becomes active, it should be identified as an issue with the first response being the contingency plan. From that point on, all documentation should be performed in the issue (see step 7.3.4) until the issue is closed and the risk is no longer active. Once that occurs, proceed to step 7.3.3.

7.3.3 Reassess the status of the risk

Any time an action is taken in regard to a risk, you should reassess the status of the risk. You should document actions taken, success or failure of responses, and other key factors that are important. You

should identify how much risk remains and determine if that impacts the risk score. Often issue and change request documents are references for your risk documentation. There are a number of reasons that this step is important:

- Often risks should return to an inactive status rather than become closed because the risk could occur again. Full documentation will allow you to choose the best option for resolution if the risk becomes active again.
- Sometimes a mitigation strategy will reduce the risk enough for it to fall off the risk register and just go back to the risk list. For example, since the risk contingency fund was approved, management of that risk has now been incorporated into the plan and the impact of those risks has been reduced. So after rescoring them, they drop off the register.
- One of PMI's best practices is to keep historical records. This is especially true in the risk area. One of the biggest complaints about risk management is the time it takes to perform. Many risks are similar from project to project. If you are able to draw from historical documentation (such as identified risks, mitigation strategies and contingency plans that worked and didn't work, and how the resulting issues were resolved) you can save significant time in your risk management process.

Finally, you need to ensure the risk register is updated appropriately. Is the risk closed or just inactive? Have you referenced all linked documentation?

7.3.4 Update the issue documentation

As noted above, active risks should become issues and should follow the issue management plan as identified in the project plan. You should track all of the actions taken to resolve the issue.



Don't forget to document attempts to resolve an issue that failed. When someone else is looking back at your documentation for another project, they may think you should have tried something else and make that their contingency plan when in reality you did try it and it didn't resolve the problem so now they are going to make the same mistake.

7.3.5 Document change requests and approvals

Some risks may force changes to the project. If this is the case, make sure you document change requests and approvals per the guidelines set forth in the project plan and link those documents back to the risk so other can see what the impact of that risk was on your project. This will help us do a better job of identifying the actual impact of a risk in future projects.

7.4 Communicate with stakeholders regarding risk events

Purpose

This point is more of a reminder. Don't overlook the importance of keeping everyone on the team informed about what is going on with any risk event. Often the biggest cause of failure on a project is not the product itself, but how and when the project status and events are communicated with the stakeholders.

Tasks**7.4.1 Follow the communication plan**

In your communication plan you should have identified when risks will be discussed and reviewed. You may review the risk register during team meetings, active risks may be discussed at executive meetings, and/or you could have a risk summary contained in your status report. An active risk should not surprise anyone.

Don't forget to talk with other project managers as well. Few projects exist in isolation. You often have to share resources. So be sure you are keeping an ear out for other projects that may be having issues that could impact your project.

7.5 Manage your budgetary reserves**Purpose**

This point is another reminder. If your project has a risk reserve or a management reserve, you need to watch it closely. It is typical for management to consider using this risk reserve money for purposes other than risk management. Risk and reserves should be used to manage risk (and not just to pay for any random scope change). Also, keep in mind just because you are 75% complete with your project and you have a significant amount of your contingency fund left, you may not be able to start spending it. In general, the later something happens in the project timeline, the more it costs. You need to examine the risks left in the project and identify how much contingency you still need or how much funds should be transferred to the Management Reserve account.

Tasks**7.5.1 Maintain reserve analysis**

You will want to keep a running total of your risk reserves. Here is an example:

Change #	Contingency Reserve Used	Mgmt Reserve Used	Contingency Balance	Mgmt Reserve Balance
Opening Balances			\$25,000	\$10,000
10	\$1,500		\$23,500	
16	\$6,000		\$17,500	
22		\$2,500		\$7,500

7.6 Conclusion

Risk monitoring and control has us continually evaluating and managing the defined risks of a project. We need to track them throughout the project's lifecycle and execute contingency strategies as needed. You will want to activate mitigation plans to reduce the likelihood of risks occurring and/or the impact if the risk should occur.

Constant vigilance by everyone on the project team is required using both the risk register (higher priority items with mitigation & contingency plans) and the risk list (complete list of all risks identified.)

Once a risk event does occur, risk owners need to be able to follow the action plans laid out and adjust as needed. Communication is one of the key elements of successful risk management. Talk about active risk events, new potential risks, other projects that could have an impact on yours, and what the fund status is.

Risk planning takes a lot of time, but it is how you monitor and respond to risks that can often dictate how successful your project is.

Appendix A: Risk Management Checklist

Use this checklist throughout Risk Management to help ensure that all requirements are met. As each item is completed, indicate its completion date. Use the Comments column to add information that may be helpful to you as you proceed through the project. If you elect NOT to complete an item on the checklist, indicate the reason and describe how you are otherwise meeting the objectives of that item.

Table 10

Item Description	Completion Date	Comments and/or Reason for Not Completing
Gather and Review Available Information:		
Identify Organizational Environment		
Identify Organizational Processes		
Review Project Scope Statement		
Review Project Management Plan		
Hold Planning Meetings and Perform Analysis		
Schedule & Plan Meetings		
Analyze Information		
Form Consensus for Risk Management Strategy		
Develop Risk Management Plan		
Define Methodology		
Define Definitions		
Define the Roles & Responsibilities		
Define the Procedures		
Select the Risk Register style		
Get Approval		
Project Team		
Sponsor		

Appendices

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Appendix B: Sample Risk Registers

Sample Risk Register 1

Risk ID	Date Submitted	Status	Risk Event	Risk Probability	Risk Impact	Risk Score	Cost Risk Quantification	Schedule Risk Quantification
12	7/5/2005	Potential	Business / Project Scheduling Conflicts	3	8	24	\$30,000	2 Weeks
	Risk Owner	Agreed Response		Quantification Comments				
	JG/CF	Mitigation		Cost basis = 50%, \$60,000 impact Schedule basis = 50%, 160 hrs				
<p>Description: There will almost certainly be general conflicts between project needs and normal business cycles of the agency. An example may be a cyclical peak in a given business process converging with a critical timeframe in system development or testing.</p>								
<p>Assessment: The project has not yet identified any conflicts of significance. The implementation plan and overall timeline have been developed to minimize these. However, testing and training will continue to require the involvement of various users, so scheduling will become critical in the later stages of each phase. Project management will monitor this issue and work with the business units and the Steering Committee to resolve any conflicts.</p>								
<p>Response Plan: Business process schedules and issues will be considered as part of the analysis leading to scheduling of future phases of the project. As specific conflicts arise during the life of the project, the project team will work with the affected business units to try to optimally balance the needs of both.</p>								
<p>Lessons Learned: This risk has not been active.</p>								

Appendices*ND Project Management Guidebook - Risk Management Supplement**Sample Risk Register 2*

Risk ID	Risk	Risk Type	Probability	Impact	Risk Score	Current Controls	Response Plan	Risk Owner
12	Business / Project Scheduling Conflicts Cost Quantification: \$30,000	Schedule	50% (3)	Serious (8)	24	None	Business process schedules and issues will be considered as part of the analysis leading to scheduling of future phases of the project. As specific conflicts arise during the life of the project, the project team will work with the affected business units to try to optimally balance the needs of both.	Sponsor Project Manager
13	Loss of funding from federal source Cost Quantification: Project actual costs at date of closeout	Financial	Unlikely (2)	Critical (10)	20	None	Monitoring of federal discussions regarding program Regular discussions with Senior Management	Sponsor

Sample Risk Management Plan

Sample Risk Register 3

ID	The risk	How can it happen? (Cause)	What can happen? (Effect)	Assessment		Risk Score	Adequacy of existing controls	Response Plan	Risk Owner
				Probability	Impact				
12	Business / Project Scheduling Conflicts	Schedule does not take into account business cycle	Staff stress, delayed schedule due to incomplete tasks, overtime, poor customer service	50% (3)	Serious (8)	24	Generally adequate	Business process schedules and issues will be considered as part of the analysis leading to scheduling of future phases of the project. As specific conflicts arise during the life of the project, the project team will work with the affected business units to try to optimally balance the needs of both.	Sponsor Project Manager
13	Loss of funding from federal source	Federal lawmakers make changes to program budgets	Project no longer has enough funding to complete the project	Unlikely (2)	Critical (10)	20	Generally adequate	Monitoring of federal discussions regarding program Regular discussions with Senior Management	Sponsor

Sample Risk Register 4

ID	Risk	Probability	Impact	Risk Score	Response Plan	Risk Owner
12	Business / Project Scheduling Conflicts	50% (3)	Serious (8)	24	Business process schedules and issues will be considered as part of the analysis leading to scheduling of future phases of the project. As specific conflicts arise during the life of the project, the project team will work with the affected business units to try to optimally balance the needs of both.	Sponsor Project Manager
13	Loss of funding from federal source	Unlikely (2)	Critical (10)	20	Monitoring of federal discussions regarding program Regular discussions with Senior Management	Sponsor

Sample Risk Management Plan

Appendix C: Sample Risk Management Plan

Project Name:		Project X			
Agency:	Agency ABC				
Business Unit/Program Area:			LMN Division		
Project Sponsor:		Nancy W			
Project Manager:		Joe P			
Date:	08/21/08			Version:	1.5

Risk Management

INTRODUCTION

Purpose and Objectives

Risk Management is the systematic process of identifying, analyzing, and responding to project risks. It includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to project objectives. A risk management plan defines how a project team will handle risks to achieve that goal.

RISK-RELATED DEFINITIONS

There are a number of terms used in risk management that should be defined to ensure clear communications.

Risk

An uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives. Risk is often a measure of the inability to achieve overall project objectives within defined project requirements and constraints and has three components: (1) the probability of occurrence, (2) the impact of the risk on the program, and (3) the time horizon during which the consequences will occur if the risk is not mitigated.

Sample Risk Management Plan

Probability of Occurrence

The following table defines the probability of occurrence.

Table 11 – Risk Probability of Occurrence

Probability range	Natural language expression	Numeric score
91% through 99%	“Very likely” to occur	5
61% through 90%	“Probably” will occur	4
41% through 60%	“May occur” about half of the time	3
11% through 40%	“Unlikely” to occur	2
1% through 10%	“Very unlikely” to occur	1

Risk Impact

The following table defines the risk impact categories and terms. For positive risks, consider the opposite of the impact description. The examples would remain the same except having a positive impact to the project.

Table 12 – Risk Impact

Impact Description	Example *	Natural language expression	Numeric score
An event that, if it occurred, would cause project failure (inability to achieve minimum acceptable requirements)	schedule adjustment >2 mo cost impact > 40%	Critical	10
An event that, if it occurred, would cause major cost/schedule increases. Secondary requirements may not be achieved.	schedule adjustment >1 mo cost impact >20%	Serious	8
An event that, if it occurred, would cause moderate cost/schedule increases, but important requirements would still be met.	schedule adjustment > 2wks cost impact > 10%	Moderate	5

Sample Risk Management Plan

An event that, if it occurred, would cause only a small cost/schedule increase. Requirements would still be achieved.	schedule adjustment > 1wk cost impact > 5%	Minor	3
An event that, if it occurred, would have no effect on the project.	schedule adjustment < 2d cost impact < 5%	Negligible	1

* These examples are simply rules of thumb and you should adjust them according to your specific project needs.

Risk Score

The risk score is a value calculated that is the product of probability of occurrence and impact. You use the score to compare risks as part of the risk prioritization process. **Table 3** is the matrix used to develop the risk score. The values range from 1 (very low exposure) to 50 (very high exposure). Although there are no specific break points in the risk exposure ranking, those risks with an exposure value of less than 20 are generally considered low risks, those risks with an exposure value between 20 and 39 are generally considered moderate risks, and those risks with an exposure value between 40 and 50 are generally considered high risks. The definitions of Low, Moderate, and High are as follows:

- **Low Risk:** Has little or no potential for increase in cost, disruption of schedule, or degradation of performance. Actions within the scope of the planned project and normal management attention should result in controlling acceptable risk. No response plans will be made for these risks. The project will monitor for them and manage them as they come up.
- **Moderate Risk:** May cause some increase in cost, disruption of schedule, or degradation of performance. Special action and management attention may be required to control acceptable risk. The project will do some response planning for these risks.
- **High Risk:** Likely to cause significant increase in cost, disruption of schedule, or degradation of performance. Significant additional action and high priority management attention will be required to control acceptable risk. The project will do in-depth response plans for these risks.

Positive risks can use the same table and descriptions except instead of trying to avoid the risk, we will endeavor to make the risk occur and gain the positive impact.

Sample Risk Management Plan

Table 13 – Risk Score

Probability	Impact				
	Negligible (1)	Minor (3)	Moderate (5)	Serious (8)	Critical (10)
Very likely to occur (5)	5	15	25	40	50
Probably will occur (4)	4	12	20	32	40
About 50% chance of occurring (3)	3	9	15	24	30
Unlikely (2)	2	6	10	16	20
Very unlikely to occur (1)	1	3	5	8	10

ORGANIZATION

This section defines the roles and responsibilities for risk management.

Project Management Office/Enterprise Project Management Office

The state of North Dakota's Enterprise Project Management Office (EPMO) has issued a project risk management supplement that this project will use to form the basis of the risk management process.

The Information Technology Department's Project Management Office provides support to the project manager and has some additional processes and templates for Software Development projects that will be employed in this project.

Roles & Responsibilities

Table 14 – Roles & Responsibilities

Project Manager: The overall coordinator of the Risk Management Program	<ul style="list-style-type: none"> • Maintaining this Risk Management Plan • Maintaining the Risk Management Data Base and distributing updates • Briefing the team on the status of risks • Tracking efforts to reduce moderate and high risk to acceptable levels • Providing risk management training • Facilitating risk assessments • Preparing risk briefings, reports, and documents required for project reviews
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Sample Risk Management Plan

<p>Project Team: Responsible for identifying, monitoring and managing risks</p>	<ul style="list-style-type: none"> • Coordinate with SMEs to review and recommend to the project manager changes on the overall risk management approach based on lessons learned • Quarterly, or as directed, participate in the update to project risk assessments made during the previous review period • Review and recommend any changes to the risk assessments made and the risk mitigation plans proposed • Report new risks to the project manager via e-mail • Ensure that risk is a required topic at each Project Meeting • Accomplish assigned mitigation tasks and report status/completion of mitigation actions to the project manager for entry into the database
<p>Subject Matter Experts (SMEs): Responsible for implementing risk management tasks per this plan</p>	<ul style="list-style-type: none"> • Review and recommend to the project manager changes on the overall risk management approach based on lessons learned • Quarterly, or as directed, participate in the update to program risk assessments made during the previous quarter • Review and recommend any changes to the risk assessments made and the risk mitigation plans proposed • Report new risks to the project manager via e-mail • Accomplish assigned mitigation tasks and report status/completion of mitigation actions to the project manager for entry into the database
<p>End Users</p>	<p>The end users will participate in the project through the SMEs. The End Users may identify risks and should pass the information through the SMEs or Project Team. All risk identification, tasking, and reporting will be handled through the project team member(s) assigned to the End User.</p>

Sample Risk Management Plan

RISK MANAGEMENT STRUCTURE AND PROCEDURES

This section describes the risk management process and provides an overview of the risk management approach.

Risk Assessment

The table below provides an overall review of the project to help determine how much risk management is appropriate for this project.

Size:	With a budget of \$490,000, this project is a medium sized project
Complexity:	This project involves multiple divisions within the organization, but does not involve any other agency or external organization. The project does work with complex formulas. We rate this medium complexity.
Importance to Business:	This project is determined to be of high priority within the agency.
Visibility:	While not directly public facing, delivers very important public information.
Agency History:	Agency seldom does IT projects of this size or complexity
Skill Levels	
Vendor:	ITD is updating an ITD based app. ITD has already done this with other sections of the app, they are just moving the rest of the app off the mainframe system.
Project Mgr.:	Relying on ITD's internal PM. Agency staff has no formal PM experience.
Agency Project Team	About 50% of the SMEs have done a similar project
Summary	
Risk Management Effort Decision:	It has been determined that the project will spend a moderate amount of time performing the following risk assessment activities.

Sample Risk Management Plan

Identification

What	Owner	Time Estimate
<p>Brainstorming/Affinity Diagram/RBS: The stakeholders will be divided into 5 groups of 6-8 people.</p> <p>One group will consist of impacted division management, including the sponsor.</p> <p>Three groups will consist of members of each impacted division (who are not part of the core project team) and should consist of at least 2 consumers and 2 SMEs from each division.</p> <p>Finally the last group will consist of the core project team.</p> <p>Each group will be brought in, given a brief overview of the project, then, using the brainstorming technique, they will be asked to identify any opportunities they see. We will then ask them to identify any risks. We will ask the groups to then perform an affinity diagram to categorize the risks and identify any missing risks/opportunities.</p> <p>In addition to the above, the core project team will perform a risk breakdown structure (RBS). This involves stepping through the Work Breakdown Structure (WBS) task by task and identifying risks & opportunities associated with the task.</p>	<p>PM</p> <p>John W will document session 1</p> <p>Kevin N will document sessions 2 & 5</p> <p>Bob N will document sessions 3 & 4</p>	<p>1-1 hour session</p> <p>3- 2 hour sessions</p> <p>1-4 hour session</p> <p>16 hours documentation</p>
<p>Delphi Technique: We will query each of the key EA architects to identify risks associated with this project. They will be given a week to respond. After they return all submissions, we will send the total risk list to them for a one-time only review. They will be given an additional week for review/response.</p>	<p>PM</p>	<p>4 hours management & documentation</p> <p>3 hours effort per architect</p> <p>2 weeks lag</p>
<p>E-mail: At the end of each of the above activities, everyone will be asked to e-mail the PM with any additional opportunities or risks that occur to them after the session.</p>	<p>PM</p>	<p>2 hours</p>

Sample Risk Management Plan

The project will use the following categories of risk in this process:

Schedule

- Schedule Creation
- Timescale

Budget

Personnel

- Project Resources
- Contractors

Project Management

- Change Mgmt
- Process
- Project Size and Duration

Expectations

- End Users
- Customer/Sponsor
- Project Vendors
- Commitment

Technological

Objectives

- Product
- Requirements

Environment

Internal

- Organization and Management
- Development Environment
- Design and Implementation

External

- Politics

Qualitative Analysis

What	Owner	Time Estimate
Review: The PM will ask the core team to review the risks to determine if they understand the risks enough to score. The team should notify the PM of any risk they are unsure of and the PM can clarify or get more information from the originator. The team will have 3 days to perform the review.	PM	2 hours to review 2 hours management 3 day lag
Scoring: The project team will determine the impact and probability scores for each risk to calculate the risk score. They will use the tables in Section 2 of this document.	Project Team	2 hours

Sample Risk Management Plan

What	Owner	Time Estimate
<p>Threshold 1: Anything with a probability of “very likely” (5) will be considered a fact and managed in the project plan.</p> <p>Threshold 2: Any thing with a risk score of 20 or below will be included on the non-critical risk list.</p>	PM	1 hour
All risks not excluded by the above thresholds will be passed to Quantitative Analysis.	PM	1 hour
Stage Gate: Meet with the Executive Steering Committee to review the key risks and get a go/no-go decision to proceed with planning.	PM	1 hour 2 hours prep

Quantitative Analysis

What	Owner	Time Estimate
A moderate risk effort indicates that an Expected Monetary Value (EMV) Analysis will be performed for each of the risked passed onto this phase.		
Analyze: The project team and SMEs from the effected divisions will meet to perform a basic EMV for each risk. A decision tree will be developed for a risk as needed.	Project Team SMEs	4 hours

Risk Response Planning

What	Owner	Time Estimate
The top risks evaluated in the Quantitative Analysis will be assigned out to the core project team, SMEs, and management if necessary. Each risk owner will be assigned to develop strategies avoid, if possible, or mitigate/transfer the risk. These responses should be documented in the risk register. Risk owners are given 1 week to complete.	Team SMEs Management (if needed)	4 hours 5 day lag
Stage Gate: Meet with the Executive Steering Committee to review the key risks and get a go/no-go decision to proceed with planning.	PM	1 hour 2 hours prep

Sample Risk Management Plan

Risk Monitoring and Control

What	Owner	Time Estimate
Monitoring: Risk owners are responsible for monitoring their risks and notifying the PM via e-mail when a trigger occurs and that the response plan has been initiated.	Risk Owners	4 hours
New Risk Identification: Any stakeholder can identify additional risks. The stakeholder should notify the project manager of the new risk (or possible risk) via e-mail.	Stakeholders	1 hour
Audits: The PM will be responsible for overseeing risk activities and ensuring the risk register is updated.	PM	2 hours per month
Review: The project team will review the project's risks biweekly (in every other weekly team meeting).	Project Team	1 hour per month
Reporting: Risks will be reported in two ways. 1 st the PM maintain a Risk Log in the project repository. The Risk Log will contain a list of risks that are active on the project, the priority of the risk, the assignment, and a current status. 2 nd the monthly Status report and the quarterly Large Project Oversight report will contain a summary of the Risk Log and any new risks identified and added to the Risk Register.	PM	1 hour per month

RISK REGISTER AND RISK LIST

The project's risk register and risk list is located in the project repository at [SharePoint site A](#).

The risk list covers the following points:

- [Risk ID](#) – A numbering system that allows a cross reference to the Risk Event.
- [Risk Event](#) – A description of the risk.
- [Activity/Task #](#) – Identifies the task or activity is this risk related.
- [Occurrence](#) – Describe when and how often this risk could take place.
- [Risk Category](#) – The category the risk is assigned.
- [Trigger](#) – Describe what would cause this risk to occur.
- [Source](#) – Enter who identified the risk.

Sample Risk Management Plan

- Probability – The likelihood that the risk will occur. See the Definitions section for possible values.
- Impact – The effect on the project objects if the risk event occurs. See the Definitions section for possible values.
- Score – Reflects the severity of the risks effect on objectives. The risk score is determined by multiplying the risk probability and risk impact values. The intent is to assign a relative value to the impact on project objectives if the risk in question should occur.

The risk register covers the following points:

- Date Identified – The date the risk was identified.
- Status – Identifies whether the risk is potential, active, or closed.
- Risk Description – A description of the risk.
- Risk Probability – The likelihood that the risk will occur. See the Definitions section for possible values.
- Risk Impact – The effect on the project objects if the risk event occurs. See the Definitions section for possible values.
- Risk Score – Reflects the severity of the risks effect on objectives. The risk score is determined by multiplying the risk probability and risk impact values. The intent is to assign a relative value to the impact on project objectives if the risk in question should occur.
- Risk Assignment – Person(s) responsible for the risk if it should occur.
- Agreed Response – The strategy that is most likely to be effective.
 - *Avoidance* – Risk avoidance entails changing the project plan to eliminate the risk or condition or to protect the project objectives from its impact.
 - *Transference* – Risk transference is seeking to shift the consequence of a risk to a third party together with ownership of the response. Transferring the risk simply gives another party responsibility for its management; it does not eliminate it.
 - *Mitigation* – Risk mitigation seeks to reduce the probability and/or consequences of an adverse risk event to an acceptable threshold. Taking early action to reduce the probability of a risk's occurring or its impact on the project is more effective than trying to repair the consequences after it occurs.
 - *Acceptance* – This technique indicates that the project team has decided not to change the project plan to deal with a risk or is unable to identify any other suitable response strategy.
- Risk Response Plan – Specific actions to enhance opportunities and reduce threats to the project's objectives.

Sample Risk Management Plan

Risk Register

Technology Risks

Risks 1 through 9 are Technology Risks. They also deal with issues related to the potential for the system to evolve and function for an acceptable life cycle.

Risk ID	Date Submitted	Status	Risk Event	Risk Probability	Risk Impact	Risk Score	Cost Risk Quantification	Schedule Risk Quantification
12	7/5/2008	Potential	Business / Project Scheduling Conflicts	50%	Serious	24	\$30,000	2 Weeks
	Risk Owner	Agreed Response		Quantification Comments				
	JG/CF	Mitigation		Cost basis = 50%, \$60,000 impact Schedule basis = 50%, 160 hrs				
Description: There will almost certainly be general conflicts between project needs and normal business cycles of the agency. An example may be a cyclical peak in a given business process converging with a critical timeframe in system development or testing.								
Assessment: The project has not yet identified any conflicts of significance. The implementation plan and overall timeline have been developed to minimize these. However, testing and training will continue to require the involvement of various users, so scheduling will become critical in the later stages of each phase. Project management will monitor this issue and work with the business units and the Steering Committee to resolve any conflicts.								
Response Plan: Business process schedules and issues will be considered as part of the analysis leading to scheduling of future phases of the project. As specific conflicts arise during the life of the project, the project team will work with the affected business units to try to optimally balance the needs of both.								
Lessons Learned: This risk has not been active.								

Appendix C: Sample Risk List

Schedule

ID #	Risk Event	Activity/ Task #	Occurrence	Risk Category	Trigger	Source:	Probability	Impact	Score

Appendix D: Sample Risk Categories

Schedule

- Change Control
- Schedule Creation
- Timescale

Budget

- Approvals
- Cash Flow
- Change Control
- Funding
- Reserves

Personnel

- Buy in/Motivation
- Competence/Experience/Training
- Contractors
- Resource Availability
- Resource Owners
- Turnover
- Workload

Project Management

- Change Mgmt
- Process
- Project Plan Quality

Expectations

- Customer/Sponsor
- End Users
- Hidden Objectives
- Project Vendors

Technological

- Hardware
- Infrastructure
- Interfaces
- New Methodology
- New Technology
- Software
- Standards

Objectives

- Product

Appendices

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Scope Creep

Unclear Requirements

Environment

Internal

Management Philosophy

Organizational Structure

Resistance to Change

External

Politics

Unions

Appendix E: Affinity Diagram

Definition:

- An affinity diagram takes a large amount of data and organizes it into related groupings. This technique is often used in combination with other gathering techniques such as brainstorming.

Objectives:

- The meeting is used to organize and focus the team on possible risks.
- It is used to get people to think creatively about issues, problems and risks.
- Should be used to organize large amounts of data

Prerequisites:

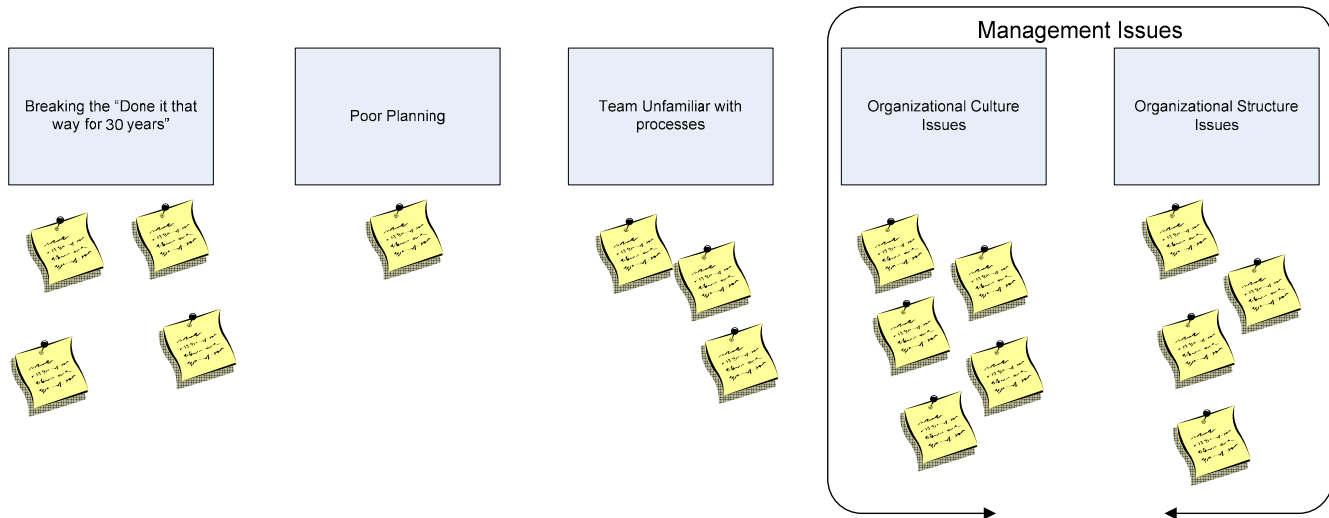
- Designate a time, length and location for the meeting.
- Meeting behavior guidelines should be agreed upon and enforced during the meeting.
 - Create an agenda
- Define clear objectives and goals.
 - Explain what the purpose or objective is to be achieved
 - Create a short written question defining the problem the team will be addressing
- Define the roles of each person participating in the session.
 - Designate a note-taker to capture the ideas being discussed.
 - Designate a facilitator to lead and coordinate the discussion.
 - Each individual is expected to participate in the discussion.

General Guidelines:

- Generate ideas. You can use one of the other techniques to accomplish this.
- Lay out ideas using sticky notes or some other form of transportable media like note cards.
- Have the team start grouping the items **without talking**. Ask the team to try not to think about it too hard. Just work through it as quickly as possible. Don't try to force something in a group if it doesn't fit. Standalones are OK. If there is disagreement and you can't reach consensus, then duplicate and put it in each category.
- Title each group
- Create Affinity Diagram

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Limitations:

- Don't use when there are smaller amounts of data (less than 15 items)
- Is less effective with groups greater than 6 people
- There may be conflicts among team members
- The hierarchy structure within the organization may inhibit some team member's participation

Conclusion:

- Handle disagreements in as simple manner as possible
- Process quickly to get first impressions
- Don't let them over think
-

Appendix F: Brainstorming Technique

Definition:

- A facilitated discussion used to generate ideas from a selected audience about a specific topic.
- A structured session requires each team member to present an idea in turn. When a team member does not have an idea they may pass.
- An unstructured session, the team members contribute ideas as they come to mind. Some team members may not feel compelled to participate.
- A silent session requires team members to write their ideas on a sticky note or paper. This prevents disruptive critiquing and provides confidentiality. This technique is best used in conjunction

Objectives:

- The meeting is used to solve problems, innovated solutions, project scheduling, building team trust, awareness and determining possible risk.

Prerequisites:

- Designate a time, length and location for the meeting.
- Meeting behavior guidelines should be agreed upon and enforced during the meeting.
 - Create an agenda
 - Critiquing and debating should be prohibited.
 - Only one conversation at a time.
- Define clear objectives and goals.
 - Explain what the purpose or objective is to be achieved
 - Create a short written question defining the problem the team will be addressing
- Define the roles of each person participating in the session.
 - Designate a note-taker to capture the ideas being discussed.
 - Designate a facilitator to lead and coordinate the discussion.
 - Each individual is expected to participate in the discussion.

General Guidelines:

- Write ideas on writable surfaces like paper or a white board putting a number next to each idea. The numbering helps team members realize how productive the session is.
- The facilitator should solicit additional comments when particular issues need further discussion.
- The facilitator should move on to other ideas to keep the process moving.
- Consider using an 'ice breaker' when participants do not know each other or are new the brainstorming technique.

Limitations:

- There may be conflicts among team members.
- Some team members personalities maybe strong and overbearing
- The hierarchy structure within the organization may inhibit some team member's participation.

Conclusion:

- Reduce the list to the most important ideas.

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- Combine the ideas that are similar
- Discuss each item on its own merits
- Eliminate ideas that may not apply to the original topic
- Each person should be given a final chance to add ideas.

Appendix G: Delphi Technique

Definition:

- An anonymous systematic interactive forecasting method of gathering information based on independent inputs from selected experts.
- The Delphi method uses a panel of carefully selected experts who answer a series of questionnaires.
- The Delphi Method is a structured approach to problem analysis which makes sure that problems and proposed solutions are thoroughly explored and examined.

Objectives:

- This technique is particularly appropriate when problem-solving, planning decision-making is required in a political or emotional environment, or when the decisions affect strong factions with opposing preferences.
- The technique eliminates bias and prevents one person from having undue influence on others.

Prerequisites:

- The Delphi technique requires a facilitator to organize requests for information from the selected participants.
 - Select a person that can facilitate and is an expert in research data collection.
- The Delphi technique requires an efficient communication channel to link the facilitator with each of the participants.
- Select a panel of experts who have an intimate knowledge of the projects objectives. This can be department managers or project leaders.
- Prior to the meeting, a list of hard constraints should be distributed to the team. The 'hard constraints' are used to set boundaries on project ranking. These constraints usually apply to all projects such as budget or mandatory requirements such as regulatory imposed requirements.

General Guidelines:

- Prepare and send the first questionnaire requesting each participant to generate as many ideas as possible for addressing a specific issue.
- Each participant lists their ideas in a brief sentence or phrase and returns the list anonymously to the facilitator.
- The facilitator prepares a second questionnaire containing all the ideas sent in response to the first questionnaire.
- The second questionnaire is sent to the team requesting comments on the strengths and weaknesses for addressing each idea and to identify any new ideas.
- This process continues until no new ideas emerge and all strengths and weaknesses have been identified.
- If highly evaluated ideas emerge via consensus, the exercise is complete. Otherwise the facilitator conducts a formal assessment of the participant's opinions of the ideas.

Limitations:

- People do not like to complete surveys and may not provide accurate information.
- This technique is a hands-off process with no insight into the caveats that go with the answers.

Conclusion:

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- Reduce the list to the most important ideas.
- Combine the ideas that are similar
- Eliminate ideas that may not apply to the original topic
- Each person should be given a final chance to add ideas.

Appendix H: Fishbone Diagram¹

Definition:

- Dr. Kaoru Ishikawa, a Japanese quality control statistician, invented the fishbone diagram. Therefore, it may be referred to as the Ishikawa diagram. The fishbone diagram is an analysis tool that provides a systematic way of looking at effects and the causes that create or contribute to those effects. Because of the function of the fishbone diagram, it may be referred to as a cause-and-effect diagram. The design of the diagram looks much like the skeleton of a fish. Therefore, it is often referred to as the fishbone diagram. Whatever name you choose, remember that the value of the fishbone diagram is to assist teams in categorizing the many potential causes of problems or issues in an orderly way and in identifying root causes. The diagram encourages the development of an in depth and objective representation ensuring all participants keep on track. It discourages partial or premature solutions, and shows the relative importance and inter-relationships between different parts of a problem.

Objectives:

- To study a problem/issue to determine the root cause.
- To study all the possible reasons why a process is beginning to have difficulties, problems, or breakdowns.
- To identify areas for data collection.
- To study why a process is not performing properly or producing the desired results.

Prerequisites:

- Designate a time, length and location for the meeting.
- Meeting behavior guidelines should be agreed upon and enforced during the meeting.
 - Create an agenda
 - Critiquing and debating should be prohibited.
 - Only one conversation at a time.
- Define clear objectives and goals.
 - Explain what the purpose or objective is to be achieved.
 - Formulate discussion questions to ensure wording prevents misunderstanding.
 - The team is divided into smaller groups.
- Define the roles of each person participating in the session.
 - Designate a note-taker to capture the ideas being discussed.
 - Designate a facilitator to lead and coordinate the discussion.
 - Each individual is expected to participate in the discussion.

General Guidelines:

- Welcome team members and clarify the purpose of the group exercise.
- Draw the fishbone diagram....
- List the problem/issue to be studied in the "head of the fish".

¹ Based upon North Carolina Department of Environment and Natural Resources <http://quality.enr.state.nc.us/tools/fishbone.htm>

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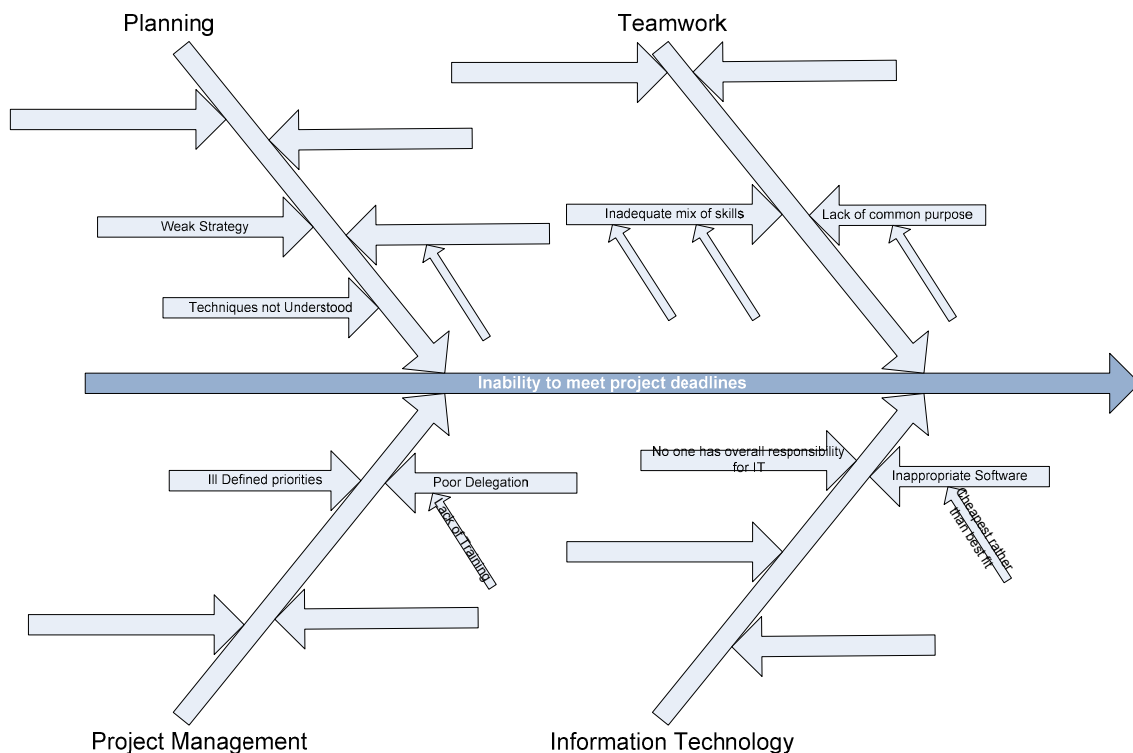
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- Label each "bone" of the "fish". The major categories typically utilized are:
 - The 4 M's: Methods, Machines, Materials, Manpower
 - The 4 P's: Place, Procedure, People, Policies
 - The 4 S's: Surroundings, Suppliers, Systems, Skills

Note: You may use one of the four categories suggested, combine them in any fashion or make up your own. The categories are to help you organize your ideas.

- Use an idea-generating technique (e.g., brainstorming) to identify the factors within each category that may be affecting the problem/issue and/or effect being studied. The team should ask... "What are the machine issues affecting/causing..."
- Repeat this procedure with each factor under the category to produce sub-factors. Continue asking, "Why is this happening?" and put additional segments to each factor and subsequently under each sub-factor.
- Continue until you no longer get useful information as you ask, "Why is that happening?"
- Analyze the results of the fishbone after team members agree that an adequate amount of detail has been provided under each major category. Do this by looking for those items that appear in more than one category. These become the 'most likely causes'.
- For those items identified as the "most likely causes", the team should reach consensus on listing those items in priority order with the first item being the most probable" cause.

Sample Fishbone Diagram



Limitations:

- Can be time consuming.
- Although groups can quickly determine potential causes, it does not usually clarify sequences of causes.

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- The magnitude and probability of a cause contributing to a need are not established as part of the technique.
- The causes identified require verification of some kind.

Conclusion:

- This analysis allows you translate the planning priorities into an action plan agreed upon by the team.

Appendix I: Interview Technique

Definition:

- The interview is a method for discovering facts and opinions held by potential users of the system being designed.
- The interview is usually done by one interviewer speaking to one expert at a time.

Objectives:

- The technique is a one-to-one interview so misunderstandings can be quickly identified and cleared up.

Prerequisites:

- Prepare and interview plan which contains the topics required to gather the information needed.
 - Determine the order in which the topics will be covered.
 - Create a question for each topic, along with an explanation of each topic.
- Determine who in the organization should be interviewed.
 - Review the organizational chart.
 - Determine the order in which you will speak to people.
 - Do not waste people's time.
- Obtain approval to speak to users.
 - Managers may want to choose the right people.
 - Managers may want to avoid political or personal issues.
- Determine how you will record responses, such as written notes, tape recorder, video, etc.
- Complete a trial run of the interview to make sure you know the interview schedule.
- Make effective use of everyone's time
 - Utilize email, phone and online schedules to complete your upfront work.
 - Prepare the meeting agenda, interview questions and circulate in advance.
 - Allow an hour or less for the interview session.
- A standard list of questions can be developed and modified to address new situations.
- Determine how the interview results will be presented.

General Guidelines:

- The interviewer should talk briefly about neutral topics to establish a rapport with the user.
- Review the objective of the interview session.
- The interviewer continually asks well structured questions to generate a conversation which the interviewee offers information. The interviewer should be ready to probe for more specific detail information.
- The interviewer should stay neutral throughout the interview.
- Before the interview ends the interviewer should check whether all the topics have been covered.
- The interviewer should summarize what they have heard to determine if they have captured the information correctly.
- The interviewer should also ask the user if all areas of concern have been discussed.

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- Schedule a follow up meeting to review the information gathered and ask if there is anything that could be improved in the process.

Limitations:

- The unstructured method of gathering information can be easily misinterpreted.
- The wrong set of people may be interviewed.
- There could be possible resistance during the interview:
 - The people being interviewed may think their job is being threatened
 - You may be trying to change the way they do their job.
 - The answers to the questions you are asking may seem obvious to those being interviewed.
- Effective listening requires concentration and this can be disturbed by interruptions.
- The information may be hard to bring together without bias.
- The subjectivity of the information gathered needs to be considered.
- Interviews are time consuming.
- Establishing and maintaining rapport with the interviewee through the session may be difficult

Conclusion:

- Comments should be sorted into problem categories.
- Recommendations can be built from the summary information.
- Taped interviews provide an accurate report of what people said.
- Eliminate ideas that may not apply to the original topic.

Appendix J: Nominal Group Technique

Definition:

- A formal technique used to identify, discuss and rank issues or ideas in a group setting in a short period of time.

Objectives:

- The technique allows everyone on the team to have an equal voice in the process.
- This technique is used when issues are controversial, members are new to each other or the team cannot reach an agreement.
- Participants are given the opportunity to think about and write down their ideas before the ideas are presented to the group.

Prerequisites:

- Designate a time, length and location for the meeting.
- Meeting behavior guidelines should be agreed upon and enforced during the meeting.
 - Create an agenda
 - Critiquing and debating should be prohibited.
 - Only one conversation at a time.
- Define clear objectives and goals.
 - Explain what the purpose or objective is to be achieved.
 - Formulate discussion questions to ensure wording prevents misunderstanding.
 - The team is divided into smaller groups.
- Define the roles of each person participating in the session.
 - Designate a note-taker to capture the ideas being discussed.
 - Designate a facilitator to lead and coordinate the discussion.
 - Each individual is expected to participate in the discussion.

General Guidelines:

- Welcome team members and clarify the purpose of the group exercise.
- The question should be written on the flipchart or whiteboard and then verbally presented and clarified.
- The team is instructed to write down their ideas to the question.
- Set a specific amount of time the team is allowed to spend on the question.
- When the time is up, each team goes around the table and each member is asked to share one response each time until all ideas are stated.
- The responses should be written on a flipchart or whiteboard by the group leader without discussion.
- The time allotted for this part of the session should not be longer than 30 minutes.
- The ideas should be discussed and clarified.
- Combine any ideas that are similar.
- Number each item on the list.
- Each team member is asked to rank the items in order of importance from the highest number to indicate the most important.
- The members submit their rankings and a total ranking is calculated for each item by adding the individual rankings.

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- Review the ranking for team consensus to determine the order in which the issues will be addressed.

Limitations:

- The team members may compile lists rather than thinking about what is critical in achieving the objectives.
- The lists are not prioritized and can be very subjective.

Conclusion:

- This analysis allows you translate the planning priorities into an action plan agreed upon by the team.

Appendix K: SWOT Analysis

Definition:

- A strategic planning framework used to analyze a project from the perspective of the project's Strength, Weakness, Opportunities and Threats.
- It involves identifying the internal and external factors, favorable and unfavorable, required to achieve the objectives of the project. It involves identifying the internal and external factors, favorable and unfavorable, required to achieve the objectives of the project.

Objectives:

- The technique is used to identify key internal and external factors important in determining whether the project objective is obtainable.
- If the objective is obtainable the SWOT inputs are used to generate a strategy.
- The technique can help uncover opportunities the team will be able to take advantage of.
- By understanding the weaknesses of the objective you can manage and eliminate threats that may otherwise catch you unaware.
- This analysis will point out what needs to be done and puts problems into perspective enabling proactive thinking rather than relying on habitual reactions.
- The technique is used to determine where change is possible. It allows you to take an inventory of your strengths and weaknesses. It will help you identify priorities as well as possibilities.

Prerequisites:

- The team must define and agree on an objective so the people contributing to and reviewing the final SWOT analysis understand the purpose of the assessment.
- The Opportunities external to the company must be kept separate from the internal Strengths.
- Set the objectives by defining what the organization is intending to do.
- Define strategic key factors in the development of the project plan.
- Determine the format you will use to communicate the issues clearly.
 - Establish a set of questions pertaining to the Strengths of the objective.
 - Establish a set of questions pertaining to the Weaknesses of the objective.
 - Establish a set of questions pertaining to the Opportunities of the objective.
 - Establish a set of questions pertaining to the Threats of the objective.
- Designate a time, length and location for the meeting.
- Meeting behavior guidelines should be agreed upon and enforced during the meeting.
 - Create an agenda
 - Critiquing and debating should be prohibited.
 - Only one conversation at a time.
- Define clear objectives and goals.
 - Explain what the purpose or objective is to be achieved
- Define the roles of each person participating in the session.
 - Designate a note-taker to capture the ideas being discussed.
 - Designate a facilitator to lead and coordinate the discussion.
 - Each individual is expected to participate in the discussion.

General Guidelines:

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- The SWOT analysis template is presented as a grid, with four sections, one for each of the SWOT headings: Strength, Weaknesses, Opportunities, and Threats.
- Either interviews or brainstorming techniques should be used to identify and evaluate adequate information.
- Write ideas on a flipchart or a white board putting a number next to each idea. The numbering helps team members realize how productive the session is.

Limitations:

- The team members may compile lists rather than thinking about what is critical in achieving the objectives.
- The lists are not prioritized and can be very subjective.

Conclusion:

- This analysis allows you to focus on your strengths, minimize threats and take advantage of opportunities.
- The SWOT approach captures the commitment of those who have to do the work of meeting the project objectives.
- The team is then able to develop goal-directed actions to meet the agreed upon objectives.
- The goal is to leverage the Strengths, optimize the Opportunities, remedy the Weaknesses and counteract the Threats. The issues should be translated into an action plan agreed upon by the team.

Charting a SWOT Analysis

Basic Charting:

You generally see three levels of charting of a SWOT analysis. One of the most common is the basic chart. This is what is described above and entails four boxes in a grid formation.

Weaknesses Weakness 1 Weakness 2 Weakness 3 Weakness 4	Strengths Strength 1 Strength 2 Strength 3 Strength 4 Strength 5
Threats Threat 1 Threat 2 Threat 3 Threat 4 Threat 5	Opportunities Opportunity 1 Opportunity 2 Opportunity 3

The layout may seem odd given the title of the technique, but it makes more sense once you proceed to a more advanced charting method. Besides, WSTO just wasn't as cool of an acronym!

Intermediate Charting:

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The next charting method starts putting some factoring into the picture. The X-Axis measures the magnitude of the SWOT factor. Weakness is a negative strength and threats are negative opportunities and each can be plotted on a continuous axis like below:

Significant Strength	5	Significant Opportunity	5
Strength	3	Opportunity	3
Minor Strength	1	Minor Opportunity	1
Neutral	0	Neutral	0
Minor Weakness	-1	Minor Threat	-1
Weakness	-3	Threat	-3
Significant Weakness	-5	Significant Threat	-5

Relevance/Probability:

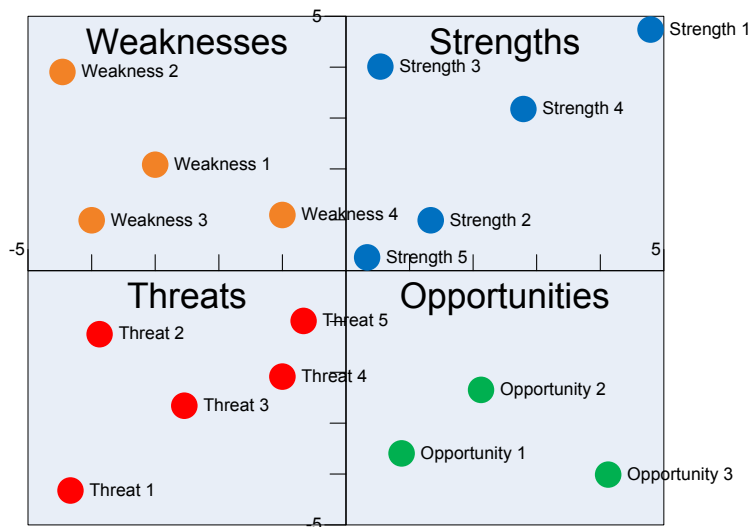
The Y-Axis is used to plot the relevance Strengths or Weaknesses and the probability of Threats or Opportunities.

Strength/Weakness Highly Relevant	5
Strength/Weakness Relevant	3
Strength/Weakness Little Relevance	1
Neutral	0
Opportunity/Threat Low Probability	-1
Opportunity/Threat Medium Probability	-3
Opportunity/Threat High Probability	-5

So a chart may look like this:

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Advanced Charting:

Strategic Impact:

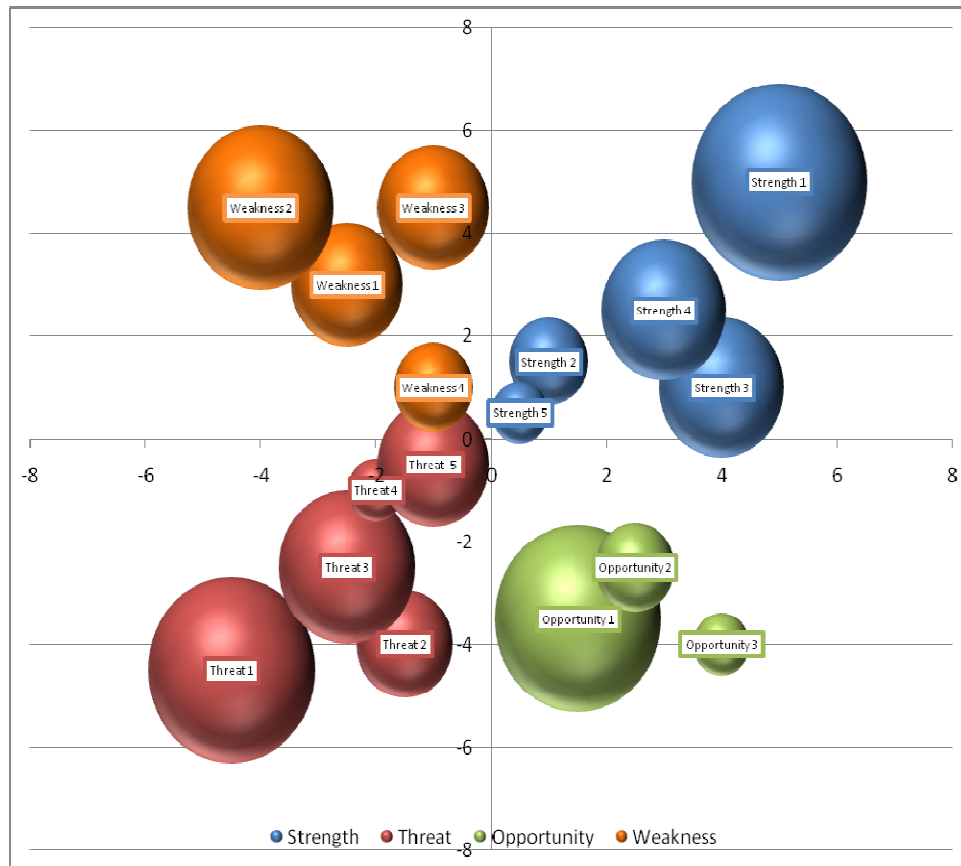
The next advancement in charting is to add the Z-Axis which is used as part of the strategic planning process. The Z-Axis is used to determine the impact of the relevant SWOT factor on the organization.

High Impact	5
Medium Impact	3
Low Impact	1

Typically you will see this done as a bubble chart with the size of the bubble indicating the strategic impact. A simple bubble chart can be done in MS Excel like the one below:

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Interpretation

Items plotted close to the (0, 0) are the least significant, either because they are not rated as importance or the probability is low.

The items plotted at the extreme ends of the chart are rated as most important and are rated as highly relevant or the probability is high.

Appendix L: Complex Risk Matrix

	Time Frame	Imminent				
		Very Low	Low	Moderate	High	Very High
	Impact	2	6	10	16	20
Probability	5	10	30	50	80	100
	4	8	24	40	64	80
	3	6	18	30	48	60
	2	4	12	20	32	40
	1	2	2	10	16	20
	Time Frame	Near-term				
		Very Low	Low	Moderate	High	Very High
	Impact	1.5	4.5	7.5	12	15
Probability	5	7.5	22.5	37.5	60	75
	4	6	18	30	48	60
	3	4.5	13.5	22.5	36	45
	2	3	9	15	24	30
	1	1.5	4.5	7.5	12	15
	Time Frame	Mid-term				
		Very Low	Low	Moderate	High	Very High
	Impact	1	3	5	8	10
Probability	5	5	15	25	40	50
	4	4	12	20	32	40
	3	3	9	15	24	30
	2	2	6	10	16	20
	1	1	3	5	8	10
	Time Frame	Far-term				
		Very Low	Low	Moderate	High	Very High
	Impact	0.5	1.5	2.5	4	5
Probability	5	2.5	7.5	12.5	20	25
	4	2	6	10	16	20
	3	1.5	4.5	7.5	12	15
	2	1	3	5	8	10
	1	0.5	1.5	2.5	4	5
	Time Frame	Very Far-term				
		Very Low	Low	Moderate	High	Very High
	Impact	0.1	0.3	0.5	0.8	1
Probability	5	0.5	1.5	2.5	4	5
	4	0.4	1.2	2	3.2	4
	3	0.3	0.9	1.5	2.4	3
	2	0.2	0.6	1	1.6	2
	1	0.1	0.3	0.5	0.8	1